SEAL OF MISSOURI STATE BOARD OF AGRICULTURE

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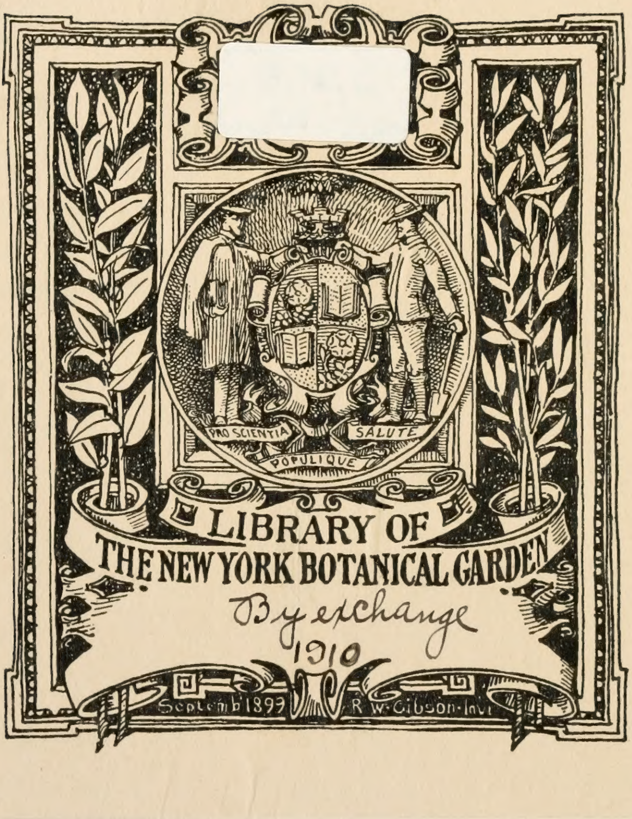
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FORTY-SECOND ANNUAL REPORT

OF THE

MISSOURI
State Board of Agriculture

A Record of the Work for the Year 1909.

ALSO VALUABLE INFORMATION ON BREEDING AND FEEDING LIVE-STOCK,
IMPROVING THE FERTILITY OF THE SOIL, GROWING CROPS,
DAIRYING, ROAD-MAKING, HOME ECONOMICS AND
THE IMPROVEMENT OF THE FARM HOME,
AGRICULTURAL AND LIVE STOCK
STATISTICS, ETC.

PUBLISHED 1910.

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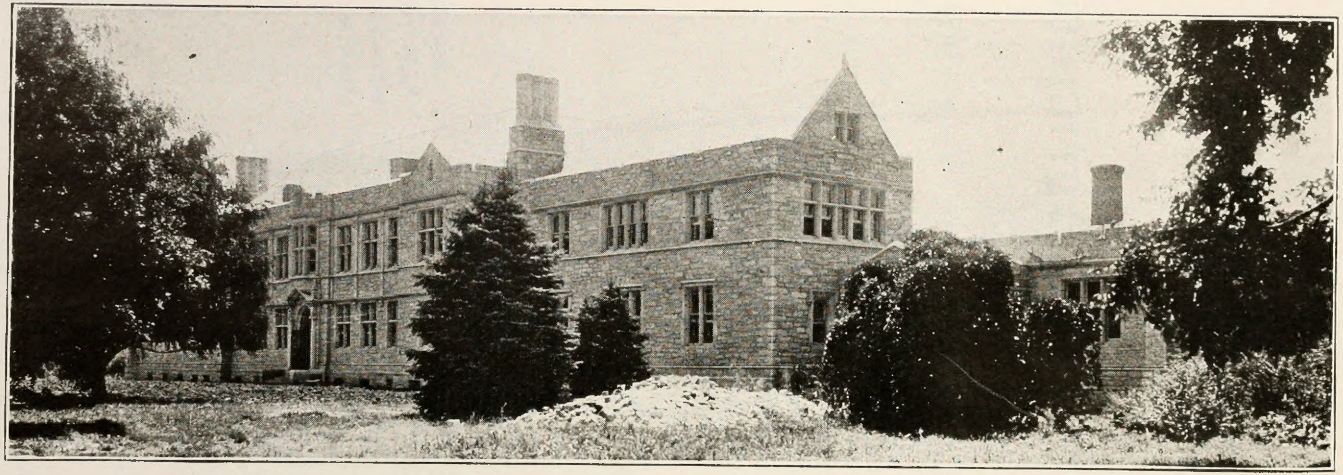

NEW $100,000 AGRICULTURAL BUILDING, UNIVERSITY OF MISSOURI, COLUMBIA.

The above picture shows the new $100,000 Agricultural College building, in which are the offices of the Missouri State Board of Agriculture. The picture, taken before the grounds had been graded, does not do full justice to the beautiful building, which is of native limestone, measures 266 feet in length, and contains almost an acre of floor space. The Missouri Agricultural College, of which F. B. Mumford is dean, is one of the best in the United States, and worthy and deserving of the fullest support and patronage of Missouri farmers. The regular University year opens September 19, 1910. In addition, there are two short winter courses in agriculture, one beginning November 1, 1910, the other January 3, 1911. Length of each short term is seven weeks.

OFFICERS OF THE STATE BOARD OF AGRICULTURE.

President—A. T. Nelson, Lebanon.
Vice-President—W. C. Hutchison, Jamesport.
Secretary—T. C. Wilson, Columbia.
Assistant Secretary—W. L. Nelson, Columbia.
Institute Director—S. M. Jordan, Columbia.
Treasurer—W. A. Bright, Columbia.
State Veterinarian—Dr. D. F. Luckey, Columbia.
State Highway Engineer—Curtis Hill, Columbia.
Deputy State Highway Engineer—F. J. Kersting.
State Apiary Inspector—M. E. Darby, Springfield.

EXECUTIVE COMMITTEE.

A. T. Nelson, Lebanon.
W. C. Hutchison, Jamesport.
F. B. Mumford, Columbia.
W. A. Dallmeyer, Jefferson City.
J. W. Boles, Auxvasse.

EX-OFFICIO MEMBERS.

Governor of Missouri, Herbert S. Hadley.
Superintendent of Schools, H. A. Gass.
Dean Agricultural College, F. B. Mumford.

CORPORATE MEMBERS.

(Term expires July 20, 1910.)

Cong. Dist.	Name.	Residence.	County.
6	John Deerwester	Butler	Bates.
9	J. W. Boles	Auxvasse	Callaway.
10	M. B. Greensfelder	Clayton	St. Louis.
11	Norman J. Colman	St. Louis City	821 Holland Bldg.
12	W. R. Wilkinson	St. Louis City	212 N. Main St.

(Term expires July 20, 1911.)

Cong. Dist.	Name.	Residence.	County.
2	W. C. Hutchison	Jamesport	Daviess.
3	A. M. Thompson	Nashua	Clay.
5	J. B. Sampson	Lee's Summit	Jackson.
13	E. E. Swink	Farmington	St. Francois.
14	R. A. Young	Alton	Howell.
16	A. T. Nelson	Lebanon	Laclede.

(Term expires July 20, 1912.)

Cong. Dist.	Name.	Residence.	County.
1	E. L. Newlon	Lewiston	Lewis.
4	Geo. H. Sly	Rockport	Atchison.
7	N. H. Gentry	Sedalia	Pettis.
8	W. A. Dallmeyer	Jefferson City	Cole.
15	S. McSmith	Reeds	Jasper.

OFFICERS OF STATE FAIR DIRECTORY.

President—R. A. Young, Alton.
Vice-President—W. A. Dallmeyer, Jefferson City.
Secretary—John T. Stinson, Sedalia.
Treasurer—C. W. McAninch, Sedalia.

EXECUTIVE COMMITTEE STATE FAIR DIRECTORY.

Norman J. Colman, St. Louis.
W. R. Wilkinson, St. Louis.
R. A. Young, Alton.
A. M. Thompson, Nashua.
A. T. Nelson, Lebanon.
N. H. Gentry, Sedalia.
E. E. Swink, Farmington.
W. A. Dallmeyer, Jefferson City.

STATE VETERINARIAN AND DEPUTIES.

D. F. Luckey, State Veterinarian	Columbia
Horace Bradley, Deputy State Veterinarian	Windsor
E. Brainerd, Deputy State Veterinarian	Memphis
W. F. Berry, Deputy State Veterinarian	Joplin
L. D. Brown, Deputy State Veterinarian	Hamilton
Henry Boettner, Deputy State Veterinarian	Perryville
L. G. Clark, Deputy State Veterinarian	Nevada
James Cullison, Deputy State Veterinarian	Charleston
A. C. Donohew, Deputy State Veterinarian	Boonville
E. M. Hendy, Deputy State Veterinarian	Jefferson City
R. B. Love, Deputy State Veterinarian	Springfield
J. H. McElroy, Deputy State Veterinarian	Grant City
R. C. Moore, Deputy State Veterinarian	Kansas City
R. J. Mitchell, Deputy State Veterinarian	Kirksville
A. J. Munn, Deputy State Veterinarian	Fayette
F. W. O'Brien, Deputy State Veterinarian	Hannibal
R. P. Poage, Deputy State Veterinarian	Shelbina
J. H. Slater, Deputy State Veterinarian	Richmond
Samuel Sheldon, Deputy State Veterinarian	Trenton
Stanley Smith, Deputy State Veterinarian	Columbia
F. M. Starr, Deputy State Veterinarian	Odessa
T. E. White, Deputy State Veterinarian	Sedalia
H. H. Wolf, Deputy State Veterinarian	Maryville
W. B. Welch, Deputy State Veterinarian	Marshall
H. C. Tuck, Deputy State Veterinarian	Morrisville
H. V. Goode, Deputy State Veterinarian	St. Joseph
J. E. King, Deputy State Veterinarian	Kansas City
C. N. Scott, Deputy State Veterinarian	Mound City
A. J. Hammerstein, Deputy State Veterinarian	St. Louis

ASSOCIATE ORGANIZATIONS.

IMPROVED LIVE STOCK BREEDERS' ASSOCIATION.

"Missouri Bred—Standard Everywhere."

President—N. H. Gentry, Sedalia.
Vice-President—Hugh Whiteford, Guilford.
Vice-President—Paul Culver, Plattsburg.
Vice-President—R. M. Brown, Carrollton.
Vice-President—John R. Potts, Mexico.
Vice-President—Dr. G. M. Laughlin, Kirksville.
Secretary-Treasurer—Geo. B. Ellis, Columbia.

MISSOURI CORN GROWERS' ASSOCIATION.

"MISSOURI CORN.

Increase the yield,
Improve the quality."

President—F. H. Crowell, Butler.
Vice-President—O. J. White, Fairfax.
District Vice-President—W. H. Brown, Clarksville.
District Vice-President—Christ Ohlendorf, Boonville.
District Vice-President—J. E. Thompson, Butler.
District Vice-President—M. McCauley, Doniphan.
Secretary-Treasurer, C. B. Hutchison, Columbia.

MISSOURI STATE DAIRY ASSOCIATION.

President—P. P. Lewis, Crescent.
1st Vice-President—A. J. McDowell, Seymour.
2nd Vice-President—Rudolph Miller, Macon.
Secretary—Thos. Speed Mosby, Jefferson City.
Treasurer—I. T. Van Note, Columbia.

MISSOURI JERSEY BREEDERS' ASSOCIATION.

President—R. F. Tesson, Clayton.
Vice-President—E. H. Nortoni, New Cambria.
Secretary-Treasurer—F. L. Austin, Columbia.

MISSOURI DRAFT HORSE BREEDERS' ASSOCIATION

President—J. F. Roelofson, Maryville.
Vice-President—J. L. Thompson, Guilford.
Secretary-Treasurer—E. A. Trowbridge, Columbia.

MISSOURI SWINE GROWERS' AND BREEDERS' ASSOCIATION.

President—G. M. Laughlin, Kirksville.
Vice-President—C. B. Adams, Grandview.
Vice-President—W. S. Cotton, Smithton.
Secretary—C. A. Willson, Columbia.
Treasurer—W. E. Bradford, Columbia.

MISSOURI SADDLE HORSE BREEDERS' ASSOCIATION.

President—Dr. R. E. Graham, Columbia.
Secretary—Rufus Jackson, Mexico.

MISSOURI SHEEP BREEDERS' ASSOCIATION.

President—S. H. Groves, Tipton.
Vice-President—Wm. Sweeney, Chilhowee.
Secretary-Treasurer—M. V. Carroll, Sedalia.

DIRECTORS.

Arch T. Grimes, Greenwood.
John A. Rankin, Tarkio.
Harry Nance, Pattonsburg.
J. W. Elliott, Polo.
S. C. Haseltine, Springfield.
D. Lee Shawhan, Lee's Summit.

MISSOURI HIGHWAY ENGINEERS' ASSOCIATION.

President—D. M. Scivally, Cape Girardeau.
Vice-President—John M. Rhodes, Richmond.
Secretary—Curtis Hill, Columbia.
Treasurer—P. S. Quinn, Columbia.

MISSOURI HOME MAKERS' CONFERENCE.

President—Mrs. N. H. Gentry, Sedalia.
Vice-President—Dr. Edna D. Day, Columbia.
Secretary—Mrs. Ivy Harner Selvidge, Columbia.
Treasurer—Miss Alice Kinney, New Franklin.

LETTER OF TRANSMITTAL.

State Board of Agriculture, Office of the Secretary,
Columbia, Mo., February 12, 1910.

To Honorable Herbert S. Hadley, Governor of Missouri:

Sir—I have the honor to transmit to you a report of the work of the State Board of Agriculture for the year 1909, including the work of the State Veterinarian, State Highway Engineer, and State Apiary Inspector.

Very respectfully,

Geo. B. Ellis, Secretary.

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A FINAL WORD

It has been the custom of this office to collect the material for the Secretary's Annual Report after the annual meeting, which is held in December. This year, owing to my retirement on March 1st, it is practically impossible to complete the report by that time. I have up to this date prepared the official part of the report with some other matter, including reprints from the monthly bulletins, and have left the work to be finished by my assistant, Hon. W. L. Nelson, who has very kindly consented to finish the copy and read the proof.

In retiring from the office I wish to acknowledge the loyalty and valuable support I have received from the members of the Board, from Assistant Secretary Nelson, State Highway Engineer Curtis Hill, State Veterinarian Dr. D. F. Luckey, and the chief stenographer, Miss J. B. Rector, as well as every member of the faculty of the Agricultural College.

To my successor I extend my hearty wish that he may be able to improve greatly on my work to the end that Missouri may become the greatest agricultural State in the Union.

To the farmers of the State who have taken such deep interest in the work of the office, I return my grateful acknowledgments.

GEO. B. ELLIS,
Secretary.

Columbia, Missouri, February 12, 1910.

ANNUAL MEETING.

MINUTES OF PROCEEDINGS.

State Board of Agriculture, Office of the Secretary,
Columbia, Mo., December 28, 1910.

The Board met on the above date in 45th annual session. The meeting was called to order by Vice-President A. T. Nelson. Roll-call showed the following members present: Messrs. Gass and Mumford, ex-officio; Messrs. Newlon, Sly, Gentry, Dallmeyer, Boles, Wilkinson, Hutchison, Thompson, Young and Nelson.

The reading of the minutes of the last annual meeting was, upon motion of Mr. Wilkinson, dispensed with, and the minutes were approved as printed in the 41st annual report.

The Secretary read the minutes of called session held on August 4, and upon motion of Mr. Greensfelder the minutes were adopted as recorded.

The next order was the reading of the Secretary's report. Mr. Greensfelder moved that the report be received and approved and ordered printed in the 42d annual report. Motion prevailed.

The State Veterinarian read his report, and upon motion of Mr. Newlon, the report was approved and ordered printed. Mr. Smith moved that a committee of four be appointed to draft quarantine regulations with reference to importation of cattle. Motion prevailed. The President appointed Messrs. Gentry, Smith, Dallmeyer and Dr. Luckey on the committee.

The State Highway Engineer, Mr. Curtis Hill, submitted the report of his department for the year, and upon motion of Mr. Gass, the report was received and ordered printed.

Mr. M. E. Darby, Apiary Inspector, made a verbal report and asked leave to submit written report later, which request was granted.

Dr. W. P. Cutler, State Dairy Commissioner, made verbal report, and was granted permission to file a report for printing.

ELECTION OF OFFICERS.

The next order of business was the election of officers. Mr. Wilkinson put in nomination Mr. A. T. Nelson for President. Upon motion of Mr. Young, the rules were suspended and Mr. Nelson was unanimously elected President by acclamation.

Mr. Greensfelder put in nomination for Vice-President Mr. W. C. Hutchison. Upon motion of Mr. Gentry, the rules were suspended and Mr. Hutchison was elected Vice-President by acclamation.

Mr. Greensfelder nominated Geo. B. Ellis for Secretary. Upon motion of Mr. Young, the rules were suspended and Mr. Ellis was declared elected by acclamation. Mr. Ellis accepted the election, but tendered his resignation to take effect March first. Mr. Greensfelder moved to accept Mr. Ellis' resignation. Motion prevailed. Dean Mumford moved that the chair appoint a committee to draft resolutions expressing the feelings of the Board on the retirement of the Secretary. Motion prevailed, and the President appointed the following committee: Dean Mumford and Messrs. Greensfelder and Gass.

Mr. Wilkinson moved to suspend the rules and elect for Assistant Secretary, Mr. W. L. Nelson. Motion prevailed.

Mr. Gentry moved to suspend the rules and elect by acclamation, W. A. Bright for Treasurer. Carried.

Mr. Wilkinson moved that the President, Vice-President and Dean, compose three members of the executive committee. Upon motion, Messrs. Dallmeyer and Boles were added to the committee.

Mr. Gentry moved to take up the election of a Secretary. Motion carried. Mr. Gentry nominated Mr. T. C. Wilson of St. Louis City. Mr. Smith put in nomination Mr. S. M. Jordan. A ballot was taken which resulted in ten votes for Mr. Wilson and four for Mr. Jordan. Mr. Boles moved to make the election unanimous. Motion carried.

REPORT OF AUDITING COMMITTEE.

The Auditing Committee reported as follows:

To the Board of Agriculture: We, the undersigned members of the committee appointed by the President to examine the financial statements of the Secretary and Treasurer, and to inspect the warrants drawn by the executive committee, have examined the same and find that the books of the Secretary agree with the financial statement submitted, and the same agrees with the report of the Treasurer of the Board.

The following warrants which had been issued at the last annual statement, but had not been presented for payment, we find have since been paid:

FARMERS' INSTITUTE FUND.

No. 1020	$ 3.15
No. 1022	2.00
No. 1023	96.54
No. 1025	20.66
No. 1028	30.00

The following warrants, for which corresponding vouchers are on file with the Secretary, have not been presented to the Treasurer for payment:

EXPENSE OF MEMBERS FUND.

No. 785	$8.50

OFFICE EXPENSE FUND.

No. 783	$14.13

STATE VETERINARY FUND.

No. 2363	$67.90
No. 2364	20.27
No. 2366	20.80

When these warrants have been presented to and paid by the Treasurer, there will be an exact agreement in balances.

Respectfully submitted,
Sanford Mc Smith,
E. L. Newlon,
J. W. Boles,
Committee.

Upon motion of Mr. Gentry, the report was adopted and committee excused.

REPORT OF AGRICULTURAL COLLEGE COMMITTEE.

The Agricultural College Committee submitted the following report:

To the State Board of Agriculture of Missouri:

Gentlemen—The Board of Examiners appointed, as required by section 4702 R. S. of Missouri, 1899, by the President of the State Board of Agriculture, to carefully examine into the affairs of the College and Experiment Station of Missouri, including the Treasurer's account, in reference to the amount and sources of the income of the College and Experiment Station, and how expended, the qualifications of those engaged in teaching and those engaged in experimental work, and the character of the work done, report as follows:

On December 27, 1909, we took up the Treasurer's account and found as follows:

The College and Experiment Station received for the year, 1909, from the United States Government on account of the Hatch fund, fifteen thousand dollars; on account of the Adams fund, thirteen thousand dollars; on account of the Morrill fund, twenty-eight thousand dollars, and from the interest on $349,881 invested in State certificates representing the Land Grant fund, created from sale of lands which the Government gave the State of Missouri, thirteen thousand dollars. The State of Missouri appropriated for the year, 1909, $175,000 out of the direct tax for general maintenance of the whole University of Missouri. Of this sum the College and Experiment Station received its share for heat, light, and other things necessary to run the departments, about $20,000.

SPECIAL APPROPRIATIONS MADE BY THE LAST LEGISLATURE AS FOLLOWS:

Production and distribution of hog cholera serum	$10,000
College of Agriculture and Mechanic Arts	10,000
Library in Agricultural department	1,000
Soil survey	15,000
Outlying experiments in soil survey	7,500
Experiment station	15,000
Animal husbandry	10,000
Furnishing new agricultural building	10,000
Power plant for agricultural building	10,000
Horticulture and botany	5,200

All of the foregoing special appropriations are given from the collateral inheritance tax, a tax levied upon the estate of persons dying without direct lineal descendants. These appropriations are not direct appropriations of the State of Missouri until the death of some one who will pay the bills. It will thus be seen that the 300,000 farms of Missouri are actually only taxed about $20,000, being a little over seven cents apiece for the maintenance of the College and Experiment Station, the United States Government being the donor responsible for the largest amount expended. The expenditures of these funds are, for salaries, labor and experiments. The items of these are reported annually to the United States Government, which sends an inspector every year from Washington to examine into the Treasurer's account, and the inspector reports to the Secretary of Agriculture. Up to date the United States Department of Agriculture is well satisfied with the way the money has been expended and the results obtained in its Agricultural College of Missouri.

As to the qualifications of those engaged in teaching and those engaged in experimental work, it will suffice to state that every one of the faculty have had repeated offers at higher salaries from other universities which they have rejected because of the love of and loyalty to Missouri, and your committee would especially direct your attention to the fact that such a state of affairs cannot last, and if Missouri desires to retain the services of these tried and true men it must provide enough funds to enable them to live decently, educate their children properly, and lay aside a little sum for the rainy day. We would further state that we have had actual instruction from the lips of these men, and can testify as to the superior quality of their work, and desire to go on record as saying that for every dollar they receive they are giving five dollars worth of vital energy.

As to the character of the work done, we will say, first: The bulletins which have been issued speak for themselves, and second: So do the students which graduate and who immediately upon, and even before graduation, receive offers of positions for which they have qualified themselves in their respective lines of study.

From the fruits you can judge the tree.

In this connection it will be proper to state that the departments of agronomy, animal and dairy husbandry, horticulture and natural science, have ready for publication material for valuable bulletins representing the labor of the last several years. To publish these at once there is a special appropriation of $5,000.00 absolutely necessary, so that the work may not be interrupted and yet the general public receive the benefit of the work as it progresses.

Your committee desires to commend the Board of Curators for finishing and furnishing the new Agricultural building. We find this building well adapted for the purposes of instruction and investigation, and for the administrative offices of the College of Agriculture, and the State Board of Agriculture.

We wish particularly to commend the new organization of the Short Winter Course in Agriculture, providing for a two years course of practical, modern instruction in agricultural subjects. This plan is in accordance with former recommendations of this Board. This course will appeal particularly to the young farmers of the State, who are not able because of their active farm duties, to enroll in the four years' college course, and those who are not able to devote the entire year to study in agriculture.

This Board has always, on every occasion, encouraged the teaching of agriculture in the rural schools of Missouri. We therefore heartily approve of the appointment by the College of Agriculture of a Department of Rural Education, and urge the expansion of this department until through it every rural school in the State may be reached through this agency.

The College of Agriculture has won during the season of 1909, seventy-seven prizes for live stock exhibits. We call attention to the fact that the College entered these contests largely upon the recommendation of the Board of Agriculture, and we, therefore, feel a special pride in these achievements.

The rapid increase in enrollment in the College of Agriculture has brought about a crowded condition of the buildings and laboratories which makes it necessary to provide larger accommodations for some departments. The College needs particularly a more ample judging pavilion, a modern dairy barn and a horse barn. The College now has no available barn suitable for horses.

The number of lines of investigation now under way in the Experiment Station makes it necessary for this department of the College to receive increased appropriations, or some of these important experiments must be dropped. Especially is more money needed for the outlying experiments, the dairy husbandry investigation, live stock investigations, and the experiments in farm crops and soil management.

Having become satisfied with the results of Home Economics in the College of Agriculture, your committee have agreed to recommend that the facilities be enlarged for the girls of Missouri, and that they be put on a par with the boys of Missouri, and that as soon as possible, additional room and instructors be provided.

W. A. Dallmeyer,
M. B. Greensfelder,
E. L. Newlon,
Committee.

Upon motion of Mr. Gass, the report was approved and the committee discharged.

The committee appointed on August 4th, to draft resolutions concerning the resignation of President Waters, submitted the following:

To the State Board of Agriculture:

Your committee appointed at the meeting held in Sedalia on August 4th, to draft suitable resolutions concerning the resignation of President H. J. Waters, beg leave to submit the following report:

Whereas, Dean H. J. Waters, president of the Board of Agriculture, tendered his resignation on August 4th, 1909, which was reluctantly and regretfully accepted; and,

Whereas, Dean Waters had been for more than fourteen years a valuable member of our organization, and had served us in various official positions with marked ability and untiring zeal in the cause of a higher agriculture; therefore, be it

Resolved by the Missouri State Board of Agriculture,

First—That in the resignation of President Waters and in his removal to another field of labor, the State loses a valuable citizen, the Board a wise counselor, the Agricultural College a great leader, and the University a loyal and devoted friend.

Second—That we, with full faith in his integrity as a man, with confidence in his ability as an educator, with knowledge of his worth as a leader, do commend him to our sister state as one who, as president of the Kansas Agricultural College, will meet the highest ideals and expectations of the people whom he has been called to serve.

Third—That the Secretary be authorized to present to President Waters an engrossed copy of these resolutions, and that the same be spread upon the records of the Board.

Respectfully submitted,

N. H. GENTRY,
A. T. NELSON,
GEO. B. ELLIS.

Upon motion of Dean Mumford, the report was adopted.

Upon motion of Mr. Greensfelder, the Secretary was authorized to secure and hang in the office of the Board a life-size bust picture of the late Hon. S. W. Hudson, and that the cost of same be paid from Office Expense fund. Motion carried.

There being no further business, the Board adjourned to meet on call of the President.

Respectfully submitted,

GEO. B. ELLIS,
Secretary.

MINUTES OF CALLED MEETING.

Springfield, Missouri,
January 27, 1910.

The Board met on above date on call of President Nelson, and the following members answered present: Messrs. Nelson, Mumford, Hutchison, Colman, Thompson, Newlon, Sly, Boles, Gentry, Dallmeyer, Smith and Young.

The Secretary read the minutes of the annual meeting held in Columbia, on December 28th, and upon motion of Governor Colman, the minutes were approved as read.

The President stated that the object of the meeting was to hear the report of the quarantine committee appointed at the annual meeting. The subject of quarantine regulations, restricting the importation of cattle into Missouri was discussed by Messrs. Gentry and Dallmeyer, and Dr. Luckey, members of the committee, and at the conclusion of the discussion, Dr. Luckey submitted the following regulations and recommended their adoption:

The importation of cattle into the State of Missouri from any other state, territory, district or country is hereby forbidden, except under the following rules and regulations:

1. Cattle for dairy or breeding purposes, before being imported into the State of Missouri, shall be inspected and found free from all contagious and infectious diseases.

2. Inspection of cattle imported into this State for dairy or breeding purposes must be made by some competent veterinarian, who is in the employment either of the United States Bureau of Animal Industry or the state in which said cattle originate, or whose certificate of health is approved in writing by the State Veterinarian or like officer of the State in which the cattle originated.

3. The inspection must include the tuberculin test, and the certificate of health must show the various temperatures of each animal before and after the injection of tuberculin, the brand of tuberculin used, the amount of tuberculin injected, the hours at which the injection was made, and the various temperatures taken, and the registry name and number of such animals as are registered.

In case any animal or animals in any lot so inspected for importation into the State of Missouri shall show a positive reaction to the tuberculin test, and be thereby rejected, that fact shall be noted on the certificate of health of such animals of the same lot as may pass inspection.

4. The certificate of health of each lot of dairy or breeding cattle shall be prepared in duplicate. One copy shall be immediately sent to the State Veterinarian at Columbia, Mo., and the other attached to the way-bill, in case of shipment, or carried by the person in charge in case such cattle are driven into the State.

5. Whenever in the judgment of the State Veterinarian it may be necessary, any cattle imported into the State of Missouri may be reinspected at any time within one year after arrival at the point of destination in this State.

6. Cattle for other than dairy or breeding purposes may be shipped or driven into the State of Missouri without inspection on a permit issued by the State

Veterinarian. In order to secure such permit, the owner or the person in charge shall prepare and furnish an affidavit, giving the number, origin and the point of destination of such cattle, and stating that they will be used for pasturing or feeding, and not for dairy or breeding purposes.

7. In case of emergency, the State Veterinarian of Missouri may issue a permit for the importation of cattle into the State of Missouri, without inspection, provided that such cattle shall be held in quarantine at the point of destination in this State until inspected and released by the State Veterinarian or a deputy State Veterinarian. The permit for such importation shall be attached to the way-bill in case of their shipment, or carried by the person in charge in case such cattle are driven into the State. The release of such cattle from quarantine shall be made in writing, and one copy of such release shall be furnished the owner of the cattle, and another copy placed on file in the office of the State Veterinarian. Such inspection for release shall be made at the expense of the owner of the cattle.

8. These regulations shall not apply to the shipment of any cattle from any other state, territory, district or country, to the public live stock markets at Kansas City, St. Joseph and St. Louis, or from one of these markets to another; but before being removed from such public markets to other parts of the State of Missouri, all imported cattle shall be subjected to the same regulations according to their class, as if coming direct from another state, territory, district or country.

9. There shall be no restriction on the importation of cattle into the State of Missouri for exhibition at any fair or live stock show held within this State: Provided, that any of such cattle as are sold to remain in this State shall, before delivery to the purchaser, be subjected to inspection.

Mr. Colman moved that the regulations submitted be adopted and that a transcript of the record be forwarded to the Governor for his approval. The motion being duly seconded by Mr. Young, was unanimously adopted. It was moved by Mr. Newton that the regulations take effect on and after May 1, 1910. Motion carried.

Dr. Luckey recommended that Dr. J. E. King, No. 1737 Genesee street, Kansas City, Missouri, be appointed Deputy State Veterinarian. Mr. Colman moved that the recommendation be approved. Motion carried.

Dr. Luckey moved that Mr. M. Easley, of Oregon county, be appointed Live Stock Inspector to assist in the tick fever eradication work; he to receive a salary of seventy-five ($75.00) dollars per month, and expenses for board and horse feed when away from home: Provided, that one-half (½) of his salary and expenses shall be paid by the Board, the other half by the Cattle Growers' Association of Oregon county. It was moved by Mr. Young that the recommendation be approved and the appointment made as per the recommendation. Motion prevailed.

Mr. Colman moved that the expenses of the quarantine committee incurred on account of a meeting held by the committee in Kansas City be allowed. Motion prevailed.

Mr. Ellis, upon request, was excused, and J. T. Stinson was requested to act as Secretary temporarily.

The committee appointed to draft resolutions with reference to the retirement of Secretary Ellis, submitted the following report prepared by Hon. M. B. Greensfelder, member of the committee. In the absence of Mr. Greensfelder, the report was read by Mr. Smith:

George B. Ellis, of Missouri, was, in 1901, elected Secretary of the State Board of Agriculture of Missouri, being, as required by law, "a practical farmer, and well versed in agricultural science."

It was a fortunate selection for Mr. Ellis, for the State Board of Agriculture and for the State of Missouri. It gave Mr. Ellis the opportunity to develop his innate qualities of honesty, patience, diligence and loyalty. As he worked with his farmers' institutes and publications, with the State Veterinarian and the State Highway Engineer, his labors molded his character, and his character stamped his work.

The State Board of Agriculture, meeting but seldom, depends for its repute and efficiency largely on the efforts of its Secretary.

From beginning to finish of his secretaryship, the Board has endorsed the work of Mr. Ellis as good, and the people of Missouri have a right in taking pride in their Board of Agriculture.

The State of Missouri has had in George B. Ellis an appointee who fully complied with section 18 of its Constitution, in that he "personally devoted his time and his powers, physically and mentally, to the performance of the duties of his office."

The State Board of Agriculture, in parting with its loyal Secretary, can honestly say to him:

"Farewell. Well done, thou good and faithful servant. Your State is yet a debtor to you. Your future career must and will be one of continued usefulness, as you have acquired the habit thereof. Glad and proud are we to be able hereto to testify."

Upon motion of Mr. Sly, the resolutions were adopted and the committee discharged.

There being no further business, Mr. Thompson moved to adjourn. Motion prevailed.

Respectfully submitted,
Geo. B. Ellis,
Secretary.

REPORT OF SECRETARY.

Gentlemen of the Board of Agriculture:

The close of 1909 brings us to the 45th mile-post in the history of our organization, and we meet today in 45th annual session in this magnificent building under very auspicious surroundings. All of the leading State Agricultural, Horticultural, and Live Stock Associations have met today upon call of the State Board of Agriculture to receive a week's instruction from the faculty of the Agricultural College, and to get from them and by association with each other, greater enthusiasm and respect for the cause we represent.

During the past few years we have seen the Agricultural Department of our State University grow from the weakest to one of the strongest. Agriculture, as a business, is receiving the recognition it has so long deserved from all classes of people. During the year, 1909, the farmers of this State have produced, in spite of overflows, drouth, and destructive insects, crops to the value of $209,219,500. The corn crop, while not the greatest in bushels, is greater in value by nearly eleven million dollars than any crop ever produced in the history of the State. A million dollars worth of corn for each county in the State is the average, while seven counties produced more than two million dollars worth each. The banner county produced, in round numbers, corn to the value of four million of dollars. The seven leading counties in the State produced a crop valued at more than twenty-one million dollars.

While discussing the great value of the corn crop it might be well to suggest that to increase the price per bushel of corn does not add that much to the reserve capital of the farmer. Only from 5 to 10 per cent of a corn crop in Missouri is exported from the counties in which it is produced, and hence, more than 90 per cent is consumed by the live stock on the farm.

High-priced corn adds greatly to the expense of maintaining the farm live stock, adds materially to the cost of producing the mutton, the wool, the pork, the beef, the dairy products, the poultry, the horses and mules sold off the farm; and higher priced corn adds materially to the cost of producing more corn and other grains.

It would appear, then, that the greatest question concerning our Board, and all other like organizations in this country, is the cheapen-ing of the cost of production rather than a greater advance in prices for farm products. Higher prices, it seems to me, are sure to re-act upon the prosperous conditions of the country; while, if the farmer can, by better methods of cultivation, better seed selection, more intelligent soil treatment, and a more general use of labor-saving machinery, increase his profits without increasing the cost of living to other classes, it will tend to aid in maintaining a healthy and prosperous condition in all parts of our country, and among all classes of business.

I believe that the farmers of Missouri have made substantial progress in adopting scientific methods and the most approved practices in farm management, but there is yet much room for improvement. When Missouri was first settled brawn was needed more than brain in the clearing of the forests and the building of homes under frontier conditions; but today with our soils greatly depleted in natural fertility, it is a question of the ability to intelligently apply scientific methods and principles rather than a question of greater physical force. During the first few years of the existence of this Board—almost half a century ago—many of the questions that concern us now were among those discussed at that time. Increasing soil fertility, improvement of the quality of live stock, more scientific methods of feeding, and better methods of crop cultivation and seed selection, were all prominent subjects discussed at the meetings in the early years of the history of the Board, and these same subjects will receive prominent places on the program of our exercises during the present week.

The first annual report of the Board of Agriculture, published in 1866, contains this quotation from the "Rural World:"

> Seed corn should always be selected in the field where the strength and vigor of the plant may be seen, and none but the fairest ears should be chosen, and these from the most productive stalks. We have fully proved the advantage of selecting seed in this way, not only in corn, but in any other variety of vegetable. The labor is no greater in making the selection at this time than in selecting the corn in the crib.

While we have learned more about the selection of seed corn,—the greater number of points to consider as to the grain, the cob, the stalk, etc.,—the above advice is just as sound today as when it was uttered; and this fact might suggest to us that it is not so much our duty to determine what science has demonstrated to be true, as it is to encourage the farmers to more generally adopt scientific methods.

THE WORK OF THE YEAR, 1909.

Your last annual meeting recommended certain new legislation and appointed a legislative committee to acquaint the members of the Legislature with the recommendations, and the success of the committee is shown in the following report:

First. The recommendation that an Immigration Bureau be created was enacted into law, but was placed under a separate board, and is now thoroughly organized, and at work.

Second. The recommendation that the police work of the pure food and dairy commission be separated from the instructional work, and that the latter be put under the control of the State Board of Agriculture, was accomplished by an act creating the office of State Dairy Commissioner, the commissioner to be appointed by the Board of Agriculture. The bill did not pass, however, until the closing hours of the session, and unfortunately no appropriation was made to carry it into effect. Upon recommendation of Governor Hadley, the Board, in special session on October 6th, appointed Dr. W. P. Cutler, the present Food and Drug Commissioner of Missouri, to the position, Dr. Cutler to serve without salary or expenses.

Third. Your committee, with the assistance of the State Highway Engineer, Mr. Curtis Hill, secured a general revision of the road laws, and the submission of an amendment to the Constitution at the next general election, providing for a levy of five cents on all taxable property of the State for the benefit of the State Good Roads fund.

Fourth. The recommendation that the law be amended so as to permit the paying of indemnity for animals affected with tuberculosis, was agreed to and passed by the General Assembly, and the law which has heretofore applied to glanders in horses now applies in cases of tuberculosis.

WATERWAYS COMMISSION.

The last General Assembly having created a Missouri Waterways Commission, the Board of Agriculture at a called meeting held on August 4th, adopted the following resolutions:

> Whereas, the 45th General Assembly has passed an act providing for the appointment of a Missouri Water-ways Commission, and the Governor has appointed such commission; and,
>
> Whereas, amongst the duties of said commission are the reclamation of the lands subject to overflow or inundation; the construction of practical and substantial levies; the ascertaining of lands now subject to inundation of the rivers; the benefits to be derived from the reclamation of lands subject to overflows or inundation; and,
>
> Whereas, the State has had for the past three years floods on the Missouri river creating an enormous amount of damage and loss of property and life; therefore, be it
>
> Resolved, (1) that the State Board of Agriculture expresses its hearty approval of the wisdom of the Legislature in passing this act, and of the Governor in his choice of commissioners, and that the Board tenders its services in any capacity that may be found to be useful to the commission in its work; (2) the State Board of Agriculture ventures to suggest that following these three damaging floods is an opportune time in which to awaken a wide-spread interest in this matter, and to secure the concerted action and co-operation of the citizens of the State.

A copy of these resolutions was forwarded to the President of the commission, who replied in the following manner:

I know the commission which has been recently appointed by Governor Hadley, and which will meet August 12, 1909, for the purpose of organization, will be more than pleased to receive your letter of August 2nd, accompanied by resolutions.

The work of the commission can be made most effective by the valuable co-operation of the various departments of the State. You can rest assured that after we have organized and gotten down to work that we will be most pleased to communicate with you, and would like to have any suggestions which your Board is willing to make.

Will you kindly give me at your convenience the names of all the members of the State Board of Agriculture, their residence, etc., and, also, will you kindly give me an idea of whether your Board has any way of determining the amount of damage done by the recent flood in the Missouri and Mississippi rivers to Missouri lands? It may be possible that your Board has had compiled the amount of acreage that is subject to overflow, etc. If so, I would like very much to hear from you.

Thanking you in advance, I beg to remain,

Yours sincerely,

(Signed) W. K. KAVANAUGH, President.

At a called meeting held in Sedalia on August 4th, Dr. H. J. Waters, Dean of the Agricultural College and President of the Board, tendered his resignation as President in the following letter:

Columbia, Mo., August 4, 1909.

To the Honorable State Board of Agriculture:

Gentlemen—I have the honor to submit herewith my resignation as President of your Board and as a member of the executive committee, to take effect not later than September 1, 1909. On that date I shall sever my connection with the Missouri College of Agriculture and enter upon the duties of President of the Kansas State Agricultural College.

In severing my connection with this Board, I desire to express my highest appreciation of the hearty support and cordial and unselfish co-operation of the members of the Board of Agriculture, which I have had during the fourteen years of my connection with the Missouri College of Agriculture.

The College of Agriculture recognizes the valuable assistance rendered it by this Board.

I thank you for the honors you have conferred upon me, and congratulate you upon the excellent work you are doing for the advancement of Missouri's chief industry.

Very respectfully,

H. J. WATERS.

The Board very regretfully accepted the resignation and appointed the following committee to draft suitable resolutions to be prepared for the consideration of the Board at this meeting: Messrs. Colman, Nelson, Gentry, and the Secretary.

To fill the vacancy made on account of the resignation of Dr. Waters, the Board elected Mr. Deerwester President, and Mr. Nelson, Vice-President; also the following executive committee to serve until the next meeting of the Board: Messrs. Deerwester, Nelson, Hutchison, Sly, and Mumford.

FARMERS' INSTITUTES.

The farmers' institute work has continued with about the usual interest and along practically the same lines as for the previous year. Two farm boys' encampments were held, one at Sweet Springs and the other at Clinton, both largely attended, and a great interest manifested.

The plan of holding six-day institutes, or extension short-courses, has been increased and more applications are being received than the funds will permit holding. One of the most valuable features of the farmers' institute work has been the boys' corn growing contests held in connection with a number of meetings. Two of these that deserve special mention are: Carthage in Jasper county, and Houston in Texas county. At Carthage 311 boys entered the contest and 138 exhibited a ten-ear sample at the fall meeting. At Houston 400 boys entered the contest and 134 exhibited. The banks and other business firms have most liberally supported this movement and contributed largely to the premium list, and in other ways rendered valuable assistance in making this feature a success.

Women's Institutes.—The first work for the women in connection with our farmers' institute service was put on last year, and while only three meetings were held they were so enthusiastically received that a number of meetings have been called for this year and quite a number have been held with the same gratifying results. I think we should be able to secure from the next Legislature a special appropriation for women's institutes and hold these meetings in every place manifesting any considerable interest.

I reported last year that the most difficult thing in holding successful institute meetings was to secure competent lecturers. The work of the Agricultural College men has increased so rapidly that but little of their time can be given to this work. The successful man who is competent to do institute work usually has sufficient business of his own that he does not want to leave it. I think we are coming to the time when it will be necessary to employ permanent institute lecturers.

The Board of Agriculture could well afford to employ six or eight men on annual salary if the funds were sufficient. Two of these men might represent the dairy interest, and during the season when no farmers' institute meetings are held, they could devote their time to visiting creameries and private dairymen, and giving itinerant instruction, and to the preparation of bulletins and the organization of local dairy improvement associations; and in the same way men representing the various lines of agriculture and live stock in this State could be employed.

Respectfully submitted,
Geo. B. Ellis,
Secretary.

SECRETARY'S FINANCIAL STATEMENT.

To the Board of Agriculture:

I beg to submit the following exhibit of the financial transactions of the Board for the year beginning December 16, 1908, and ending December 28, 1909, which shows the balances on hand at the beginning of the year, the requisitions drawn on State Auditor, warrants drawn on W. A. Bright, Treasurer of the Board, balances in the treasury of the Board, and the balances in the different funds remaining in the State treasury:

PRINTING AND DISTRIBUTION OF ANNUAL REPORT FUND.

Date.	War. No.	Name.	Dr.	Cr.
1909.				
July 30	154	By E. A. Remley		$255.00
" 30		To requisition	$300.00	
" 30	155	By Scurlock Transfer Co		12.61
Aug. 4	156	National Paper Co		9.45
Sept. 2	157	E. A. Remley		170.00
" 2		To requisition	200.00	
Oct. 6	158	By E. A. Remley		34.71
" 6	159	Pacific Express Co		18.23
			$500.00	$500.00

MONTHLY CROP REPORT FUND.

Date.	War. No.	Name.	Dr.	Cr.
1908.				
Dec. 15		To balance	$146.47	
" 16	488	By National Paper Co		$17.60
1909.				
Jan. 13	489	Columbia Statesman		20.00
Feb. 2	490	Farnsworth-Childs Co		15.29
Mar. 1	491	Smith Premier T. W. Co		14.46
" 1	492	Columbia Statesman		6.00
" 18	493	T. W. Whittle		30.00
" 31	494	Smith Premier T. W. Co		2.45
" 31	495	T. W. Whittle		32.00
Apr. 15	496	Columbia Statesman		3.00
May 3	497	T. W. Whittle		1.60
" 3	498	American Express Co		3.75
" 19	499	Smith Premier T. W. Co		3.50
" 19	500	Columbia Statesman		2.50
" 19	501	Barnes-Crosby Co		7.38
" 19	502	T. W. Whittle		15.00
" 19		To requisition	100.00	
" 19	503	By John M. Evvard		2.75
June 8	504	Scurlock Transfer Co		5.88
" 8	505	T. W. Whittle		10.90
" 8	506	Smith Premier T. W. Co		3.75
" 8	507	T. W. Whittle		22.50
" 8	508	Columbia Statesman		25.00
" 8	509	Barnes Crosby Co		4.25
" 8		To requisition	100.00	

MONTHLY CROP REPORT FUND—Continued.

Date.	War. No.	Name.	Dr.	Cr.
1908.				
July 1	510	By Statesman Pub. Co		$8.00
" 1	511	T. W. Whittle		8.00
" 1	512	Smith Premier T. W. Co		2.91
" 1	513	T. W. Whittle		25.00
" 1	514	W. L. Nelson		51.90
" 1	515	R. P. Scurlock		4.71
" 1	516	National Paper Co		29.05
" 1		To requisition	$100.00	
" 30	517	By T. W. Whittle		5.62
" 30	518	Smith Premier T. W. Co		2.50
" 30	519	E. A. Remley		25.00
" 30	520	E. A. Remley		42.50
" 30		To requisition	100.00	
Aug. 4	521	By Mattie Troxell		2.62
" 4	522	Statesman Pub. Co		38.00
" 4	523	National Paper Co		14.24
Sept. 2	524	F. E. Guynee		4.12
" 2	525	Statesman Pub. Co		5.50
" 2	526	American Express Co		43.45
" 2	527	E. A. Remley		30.00
" 2	528	R. P. Scurlock		41.21
" 2	529	E. A. Remley		3.08
" 2		To requisition	100.00	
Oct. 6	530	By E. A. Remley		40.00
" 6	531	Pacific Express Co		67.88
" 6	532	Smith Premier T. W. Co		5.30
" 6	533	Barnes-Crosby Co		3.13
" 6	534	E. A. Remley		34.00
" 6	535	E. A. Remley		4.05
" 6	536	National Paper Co		12.50
" 6		To requisition	200.00	
" 16	537	By Geo. D. Barnard & Co		48.00
" 16	538	Statesman Pub. Co		4.00
Nov. 3	539	Smith Premier T. W. Co		35.00
" 3	540	E. A. Remley		30.00
" 3	541	Pacific Express Co		18.01
" 3	542	E. A. Remley		2.75
" 3		To requisition	200.00	
Dec. 6	543	By Barnes-Crosby Co		4.75
" 6	544	American Express Co		5.97
" 6	545	Orange Judd Co		11.14
" 6	546	E. A. Remley		2.55
" 6	547	Smith Premier T. W. Co		4.50
" 6	548	E. A. Remley		20.00
" 6	549	E. A. Remley		40.00
" 6	550	F. M. Ludwick		42.31
" 28		To overdraft	26.34	
			$1,072.81	$1,072.81

EXPENSE OF MEMBERS FUND.

Date.	War. No.	Name.	Dr.	Cr.
1908.				
Dec. 15		To balance	$294.30	
" 16	742	By A. T. Nelson		$21.65
" 16	743	Sanford McSmith		14.50
" 16	744	E. E. Swink		17.00
" 16	745	N. J. Colman		11.00
" 16	746	W. C. Howell		15.20
" 16	747	W. B. McRoberts		14.00
" 16	748	W. C. Hutchison		14.75
" 16	749	A. M. Thompson		15.50
" 16	750	J. L. Christian		25.00
" 16	751	N. H. Gentry		7.14
" 16	752	J. B. Sampson		15.75
" 16	753	W. R. Wilkinson		9.50
" 16	754	John Deerwester		10.60
" 16	754a	R. A. Young		29.50
" 16	755	H. A. Gass		4.65
" 16	756	J. W. Boles		5.95
" 16	757	M. B. Greensfelder		15.00
1909.				
Mar. 1	758	Geo. B. Ellis		5.40
" 1	759	H. J. Waters		5.40
" 1	760	S. McSmith		10.40
" 18	761	H. J. Waters		5.40
" 18	762	Geo. B. Ellis		5.40
May 19	763	W. B. McRoberts		14.00
" 19	764	Geo. B. Ellis		33.23
" 19	765	H. J. Waters		9.00
" 19	766	W. B. McRoberts		12.24
" 19	767	John Deerwester		6.30
" 19		To requisition	200 00	
July 30	768	By John Deerwester		11.70
" 30	769	Shields & Courts		3.00
Aug. 4	770	E. L. Newlon		21.20
" 4	771	J. B. Sampson		6.76
" 4	772	J. W. Boles		10.90
" 4	773	Geo. H. Sly		17.03
" 4	774	A. T. Nelson		17.20
" 4	775	H. J. Waters		7.21
" 4	776	S. McSmith		12.10
" 4	778	Geo. B. Ellis		5.46
" 4	779	John Deerwester		9.74
" 4	780	W. C. Hutchison		16.90
Sept. 2	781	Geo. B. Ellis		9.75
Oct. 6	782	W. A. Dallmeyer		6.03
" 6	783	Geo. B. Ellis		15.06
" 6		To requisition	100.00	
Nov. 3	784	By Geo. B. Ellis		13.77
Dec. 6		To requisition	200.00	
" 6	785	By John Deerwester		8.50
" 28		By balance		248.49
			$794.30	$794.30

OFFICE EXPENSE FUND.

Date.	War. No.	Name.	Dr.	Cr.
1908.				
Dec. 15		To balance	$99.32	
1909.				
Feb. 2	736	By Strawn-Holland Co		$7.10
“ 2	737	Columbia Statesman		8.00
“ 2	738	W. E. Harshe		5.30
Mar 1	739	University Co-op. Store		6.80
“ 1	740	Count Harvey		20.00
“ 1	741	R. P. Scurlock		2.49
“ 1	742	Columbia Statesman		2.50
“ 1	743	W. E. Harshe		3.23
“ 1	744	Columbia Telephone Co		7.05
May 3	745	Count Harvey		16.02
“ 3	746	Western Union Co		2.74
“ 3	747	Scurlock Transfer Co		4.30
“ 3	748	T. W. Whittle		10.00
“ 3	749	Amer. Express Co		1.55
“ 3	750	W. E. Harshe		2.00
“ 19	751	Bufton Book Co		7.75
“ 19		To requisition	100.00	
“ 19	752	By Count Harvey		13.22
June 8	753	Amer. Express Co		3.20
“ 8	754	Col. Telephone Co		4.70
“ 8	755	Barnes-Crosby Co		4.25
July 1	756	Frank C. Wood		20.67
“ 1	757	Col. Telephone Co		2.25
“ 30	758	W. E. Harshe		5.05
“ 30	759	Statesman Pub. Co		20.00
“ 30	760	Scurlock Transfer Co		18.00
Aug. 4	761	Statesman Pub. Co		25.00
“ 4	762	Western Union		3.63
“ 4	763	F. C. Wood		3.75
Sept. 2	764	W. E. Harshe		4.55
“ 2	765	Col. Telephone Co		3.45
“ 2		To requisition	200.00	
Oct. 6	766	By Mike Sevier		2.50
“ 6	767	Newman Hdw. Co		1.65
“ 6	768	Troxell Robinson Co		23.78
“ 6	769	F. M. Ludwick		5.00
“ 16	770	Col. Telephone Co		5.00
“ 16	771	L. P. Stephens		4.00
Nov. 3	772	Newman Hdw. Co		16.00
“ 3	773	Smith Premier Co		2.25
“ 3	774	Troxell Robinson Co		44.55
“ 3	775	W. E. Harshe		7.75
“ 3	776	L. V. Davis		7.20
“ 3	777	Ira T. G. Stone		19.25
“ 3	778	Col. Telephone Co.		6.70
Dec. 6	779	Col. Telephone Co		7.35
“ 6	780	L. V. Davis		13.05
“ 6	781	Newman Hdw. Co		10.75
“ 6	782	Chas. W. Furtney		13.75
“ 6	783	Macmillan Co		14.13
“ 6		To requisition	100.00	
“ 28		By balance		56.11
			$499.32	$499.32

STATE VETERINARY FUND.

Date.	War. No.	Name.	Dr.	Cr.
1908.				
Dec. 15		To balance	$600.82	
" 16	2225	By H. H. Wolf		89.00
" 16	2226	C. E. Steele		11.91
" 16	2227	A. J. Hammerstein		20.00
" 16	2228	H. C. Tuck		190.75
" 16	2229	R. P. Poage		43.50
" 16	2230	Lee Gilbert		50.00
" 16	2231	A. C. Donahue		5.75
" 16	2232	Chas. D. Folse		10.00
" 16	2233	C. E. Colton		10.00
" 16	2234	J. E. Taylor		77.40
" 16	2235	D. F. Luckey		150.00
" 16	2236	Stanley Smith		8.75
1909.				
Jan. 13	2237	American Express Co		3.91
" 13	2238	S. H. Elkins		3.50
Mar. 1	2239	S. H. Elkins		6.00
May 19	2240	Col. Telephone Co		11.95
" 19	2241	R. C. Moore		146.65
" 19	2242	F. L. Austin		200.00
" 19	2243	F. W. O'Brien		8.74
" 19	2244	R. J. Mitchell		11.02
" 19	2245	Stanley Smith		15.45
" 19	2246	C. E. Steel		34.98
" 19	2247	L. D. Brown		525.49
" 19	2248	D. F. Luckey		891.61
" 19	2249	S. Sheldon		66.54
" 19	2250	A. C. Donahue		7.50
" 19	2251	T. E. White		5.80
" 19	2252	H. H. Wolf		11.14
" 19	2253	J. H. McElroy		9.40
" 19	2254	W. F. Berry		10.80
" 19	2255	Jas. Cullison		65.39
" 19	2256	H. C. Tuck		544.29
" 19	2257	A. J. Hammerstein		119.51
" 19	2258	T. W. Whittle		15.00
" 19		To requisition	3,500.00	
June 8	2259	By T. E. White		6.37
" 8	2260	D. F. Luckey		188.52
" 8	2261	R. P. Poage		8.38
" 8	2262	W. E. Harshe		3.75
" 8	2263	R. C. Moore		42.50
" 8	2264	Helen M. Marsh		3.50
" 8	2265	J. H. Slater		10.29
" 8	2266	W. B. Welch		16.89
" 8	2267	T. W. Whittle		20.00
" 8	2268	Western Union Co		1.67
" 8	2269	Columbia Statesman		12.00
" 8	2270	H. C. Tuck		192.66
" 8	2271	L. D. Brown		164.82
" 8	2272	S. Sheldon		20.00
" 8	2273	A. J. Hammerstein		40.18
" 8		To requisition	500.00	
July 1	2274	By Statesman Pub. Co		7.00
" 1	2275	A. J. Munn		16.00
" 1	2276	Stanley Smith		17.18
" 1	2277	Horace Bradley		16.18
" 1	2278	Robert Hill		25.00
" 1	2279	Western Union		1.44
" 1	2280	T. W. Whittle		15.00
" 1	2281	D. F. Luckey		235.47
" 1	2282	National Paper Co		30.00
" 1	2283	L. D. Brown		223.75

STATE VETERINARY FUND—Continued.

Date.	War. No.	Name.	Dr.	Cr.
1908.				
July 1	2284	By Jas. Cullison		$17.00
" 1	2285	H. C. Tuck		218.05
" 1	2286	R. C. Moore		47.50
" 1		To requisition	$1,000 00	
" 30	2287	By L. D. Brown		208.24
" 30	2288	Smith Premier Co		7.50
" 30	2289	D. F. Luckey		224.29
" 30	2290	E. A. Remley		15.00
" 30	2291	Horace Bradley		55.16
" 30	2292	D. M. Starr		10.50
" 30	2293	A. J. Hammerstein		31.20
" 30	2294	Robt. Hill		25.00
" 30	2295	H. H. Wolf		11.78
" 30	2296	C. E. Barkshire		2.25
" 30	2297	E. A. Remley		85.00
" 30	2298	F. C. Wood		24.65
" 30	2299	J. E. Taylor		45.75
" 30	2300	W. A. Norman		183.50
" 30	2301	H. C. Tuck		221.50
" 30	2302	W. F. Berry		12.00
" 30		To requisition	1,500 00	
" 30	2303	By Scurlock Transfer Co		15.00
Aug. 4	2304	R. P. Poage		12.38
" 4	2305	Statesman Pub. Co		27.50
" 4	2396	R. C. Moore		133.85
" 4	2307	Col. Telephone Co		2.35
Sept. 2	2308	R. G. Houston		30.00
" 2	2309	Robert Hill		50.00
" 2	2310	J. E. Taylor		72.35
" 2	2311	A. J. Hammerstein		36.20
" 2	2312	Pacific Express Co		5.64
" 2	2313	J. H. Slater		19.16
" 2	2314	H. F. Boettner		48.71
" 2	2315	Smith Premier Co		9.35
" 2	2316	W. B. Welch		8.15
" 2	2317	R. C. Moore		125.65
" 2	2318	D. F. Luckey		233.71
" 2	2319	W. A. Norman		152.50
" 2	2320	Statesman Publishing Co		1.50
" 2	2321	E. A. Remley		20.00
" 2	2322	L. D. Brown		243.88
" 2	2323	H. C. Tuck		235.80
" 2	2324	J. E. Taylor		80.25
" 2		To requisition	500.00	
" 2	2325	By R. B. Love		42.30
" 2	2326	J. T. Steele		5.00
" 2	2327	H. H. Wolf		9.88
Oct. 6	2328	H. H. Wolf		26.79
" 6	2329	J. H. Slater		9.44
" 6	2330	Scurlock Transfer Co		21.61
" 6	2331	D. F. Luckey		218.84
" 6	2332	Western Union Co		2.31
" 6	2333	A. J. Hammerstein		36.20
" 6	2334	E. A. Remley		15 00
" 6	2335	Robert Hill		40.00
" 6	2336	W. A. Norman		133.25
" 6	2337	H. V. Goode		16.64
" 6	2338	A. Brainard		7.00
" 6	2339	R. C. Moore		143.13
" 6	2340	H. C. Tuck		222.50
" 6	2441	L. D. Brown		235.50

STATE VETERINARY FUND—Continued.

Date.	War. No.	Name.	Dr.	Cr.
1908.				
Oct. 6		To requisition	$2,000.00	
" 16	2342	By George D. Barnard Co		$48.00
" 16	2343	Col. Telephone Co		2.50
" 16	2344	A. J. Hammerstein		5.20
" 16	2345	Frank S. Betz Co		16.00
Nov. 3	2346	T. E. White		5.75
" 3	2347	Robert Hill		18.75
" 3	2348	J. H. Slater		22.96
" 3	2349	E. A. Remley		17.00
" 3	2350	F. M. Ludwick		24.00
" 3	2351	By R. C. Moore		62.50
" 3	2352	Statesman Pub. Co		12.00
" 3	2353	H. C. Tuck		221.75
" 3	2354	L. D. Brown		230.69
" 3	2355	D. F. Luckey		189.31
" 3	2356	W. A. Norman		124.20
" 3		To requisition	1,000.00	
" 3	2357	By Col. Telephone Co		1.75
Dec. 6	2358	Col. Telephone Co		1.25
" 6	2359	R. L. Hill		35.70
" 6	2360	R. G. Houston		9.25
" 6	2361	L. D. Brown		226.44
" 6	2362	D. F. Luckey		198.50
" 6	2363	R. C. Moore		67.90
" 6	2364	L. G. Clark		20.27
" 6	2365	H. C. Tuck		237.36
" 6	2366	A. J. Hammerstein		20.80
" 6	2367	Jas. Cullison		5.00
" 6	2368	C. H. Dana		11.64
" 6	2369	H. H. Wolf		8.00
" 6	2370	Jas. Cullison		22.32
" 6	2371	A. J. Hammerstein		19.30
" 28		To overdraft	100.65	
			$10,701.47	$10,701.47

STATE HIGHWAY ENGINEER FUND.

Date.	War. No.	Name.	Dr.	Cr.
1908.				
Dec. 15		To balance	$645.51	
" 16	117	By Pacific Express Co		$24.50
" 16	118	American Express Co		4.95
" 16	119	Economy Drawing Table Co		23.40
" 16	120	S. H. Elkins		37.50
" 16	121	Curtis Hill		226.41
" 16	122	J. C. Pritchard		134.70
" 16	123	R. P. Scurlock		4.79
" 16	124	Eugene Dietzgen Co		156.59
" 16	125	Count Harvey		10.16
" 16	126	Etta Gilbert		50.00
" 16		To requisition	1,000.00	
" 30	127	By D. Ward King		16.80
" 30	128	National Paper Co		5.65
" 30	129	Count Harvey		6.77
Feb. 2	130	Etta Gilbert		50.00
" 2	131	D. Ward King		66.50
" 2	132	S. H. Elkins		30.00

STATE HIGHWAY ENGINEER FUND—Continued.

Date.	Wor. No.	Name.	Dr.	Cr.
1908.				
Feb. 2	133	By J. C. Pritchard		$176.08
" 2	134	Scurlock Transfer Co		6.12
" 2	135	Count Harvey		13.40
" 2	136	Smith Premier Co		4.25
" 2	137	Curtis Hill		200.00
Mar. 1	138	Geo. L. Cooley		50.00
" 1	139	L. Ruckert		2.34
" 1	140	Etta Gilbert		50.00
" 1	141	S. H. Elkins		40.00
" 1	142	O. W. Childs		10.34
" 1	143	Curtis Hill		111.14
" 1	144	Eugene Dietzgen		10.00
" 1	145	American Express Co		6.40
" 1	146	Col. Statesman		12.00
" 1	147	S. H. Elkins		8.60
" 1	148	R. P. Scurlock		7.93
" 1	149	W. L. Nelson		6.40
" 18	150	John A. Williams		56.42
" 18	151	Barnes-Crosby Co		21.57
" 31	152	Susie McGuire		1.65
May 3	153	Smith Premier Co		1.96
" 19	154	Col. Telephone Co		4.60
" 19	155	Etta Gilbert		100.00
" 19	156	D. Ward King		338.40
" 19	157	Curtis Hill		741.01
" 19	158	Geo. L. Cooley		16.47
" 19	159	J. C. Pritchard		440.88
" 19	160	Shields & Courts		6.50
" 19	161	T. W. Whittle		15.00
" 19		To requisition	$2,500.00	
June 8	162	By Curtis Hill		239.01
" 8	163	L. Ruckert		3.36
" 8	164	Pacific Express Co		3.90
" 8	165	Etta Gilbert		50.00
" 8	166	T. W. Whittle		10.00
" 8	167	Barnes-Crosby Co		17.95
July 1	168	Western Union Tel. Co		1.21
" 1	169	T. W. Whittle		15.00
" 1	170	National Paper Co		17.45
" 1	171	Etta Gilbert		50.00
" 1	172	Curtis Hill		200.00
" 1	173	American Express Co		4.00
" 1		To requisition	500.00	
" 30	174	By Smith Premier Co		8.00
" 30	175	E. A. Remley		15.00
" 30	176	Curtis Hill		241.35
" 30	177	R. P. Scurlock		7.70
" 30	178	Etta Gilbert		50.00
" 30	179	E. A. Remley		85.00
" 30	180	L. Ruckert		3.17
" 30		To requisition	500.00	
" 30	181	By Scurlock Transfer Co		15.00
Aug. 4	182	Statesman Pub. Co		10.00
" 4	183	Col. Telephone Co		4.50
Sept. 2	184	Etta Gilbert		50.00
" 2	185	L. Ruckert		2.61
" 2	186	Curtis Hill		304.25
" 2	187	Col. Herald Newspaper Co		2.25
" 2	188	E. A. Remley		25.00
" 2	189	Col. Herald Newspaper Co		6.50
" 2		To requisition	500.00	

STATE HIGHWAY ENGINEER FUND—Continued.

Date.	War. No.	Name.	Dr.	Cr.
1908.				
Oct. 6	190	By E. A. Remley		$15.00
“ 6	191	Curtis Hill		276.57
“ 6	192	F. J. Kersting		203.62
“ 6	193	D. Ward King		6.92
“ 6	194	Etta Gilbert		40.00
“ 6	195	Troxell-Robinson Co		58.22
“ 6	196	R. G. Houston		20.00
“ 16	197	Geo. D. Barnard Co		48.00
“ 16	198	Col. Telephone Co		3.55
Nov. 3	199	Curtis Hill		271.85
“ 3	200	F. J. Kersting		196.24
“ 3	201	Economy Drawing Table Co		16.20
“ 3	202	Jno. W. Williams		13.30
“ 3	203	Shields & Courts		2.50
“ 3	204	Etta Gilbert		25.00
“ 3	205	E. A. Remley		15.00
“ 3	206	R. G. Houston		10.50
“ 3	207	L. Ruckert		3.55
“ 3	208	Ira T. G. Stone		25.75
“ 3		To requisition	$500.00	
“ 3	209	By Col. Telephone Co		1.50
Dec. 6	210	Col. Telephone Co		1.50
“ 6	211	F. J. Kersting		200.74
“ 6	212	Barnes-Crosby Co		37.46
“ 6	213	Curtis Hill		305.83
“ 6	214	L. Ruckert		1.04
“ 6	215	Etta Gilbert		25.00
“ 6	216	E. A. Remley		10.00
“ 6	217	Barnes-Crosby Co		3.75
“ 6	218	E. A. Remley		16.00
“ 6		To requisition	1,000.00	
“ 28		By balance		540.53
			$7,145.51	$7,145.51

APIARY INSPECTION FUND.

Date.	War. No.	Name.	Dr.	Cr.
1908.				
Dec. 15		To balance	$71.59	
“ 16	13	By M. E. Darby		$71.59
1909.				
July 1		To requisition	200.00	
Aug. 4	14	By M. E. Darby		330.20
Sept. 2	15	M. E. Darby		80.55
“ 2		To requisition	300.00	
Oct. 6	16	By M. E. Darby		172.35
“ 6		To requisition	200.00	
“ 16	17	By E. A. Remley		25.50
Nov. 3	18	M. E. Darby		164.55
Dec. 6	19	M. E. Darby		138.00
“ 6		To requisition	300.00	
“ 28		By balance		88.85
			$1,071.59	$1,071.59

FARMERS' INSTITUTE FUND.

Date.	War. No.	Name.	Dr.	Cr.
1908.				
Dec. 15		To balance	$1,366.48	
" 16	1031	By Geo. W. Williams		$80.50
" 16	1032	Columbia Telephone Co		2.65
" 16	1033	C. D. Lyon		94.34
" 16	1034	Edna D. Day		9.74
" 16	1035	Jno. M. Evvard		10.12
" 16	1036	Ilena Bailey		30.35
" 16	1037	Barnes-Crosby Co		6.23
" 16	1038	O. E. Reed		10.20
" 16	1039	W. H. Chandler		33.26
" 16	1040	Jas. E. Stowers		8.17
" 16	1041	C. D. Lyon		98.03
" 16	1042	Columbia Statesman		34.50
" 16	1043	S. H. Elkins		50.00
" 16	1044	C. O. Raine		75.00
" 16	1045	Edna D. May		150.00
" 16	1046	Smith Premier T. W. Co		4.50
" 16	1047	S. M. Jordan		200.00
" 16	1048	Geo. W. Williams		150.00
" 16	1049	M. F. Miller		10.24
" 16	1050	D. Ward King		100.00
" 16	1051	F. G. King		50.00
" 16	1052	D. F. Luckey		39.62
" 16	1053	D. F. Luckey		16.74
" 16	1054	C. H. Eckles		11.62
" 16	1055	Shields & Courts		6.00
" 16	1056	J. W. Connaway		36.49
" 16	1057	C. F. Troxell		31.00
" 16	1058	E. A. Trowbridge		11.62
" 16	1059	W. L. Howard		12.05
" 16		To requisition	2,000.00	
" 17	1060	By H. D. Hughes		10.00
" 30	1061	S. H. Elkins		20.00
" 30	1062	Barnes-Crosby Co		3.85
" 30	1063	C. O. Raine		28.80
" 30	1064	F. H. Demaree		10.15
" 30	1065	Geo. W. Williams		10.08
" 30	1066	F. B. Mumford		10.37
" 30	1067	S. M. Jordan		3.96
" 30	1068	Kneisley Banta		4.14
1909.				
Jan. 13	1069	Columbia Statesman		50 00
" 13	1070	H. W. Mumford		21.00
" 13	1071	G. F. Troxell		4.00
" 13	1072	W. C. Howell		21 10
" 13	1073	W. C. Hutchison		18.75
" 13	1074	A. M. Schwiech		2.50
" 13	1075	N. H. Gentry		12.50
" 13	1076	C. B. Hutchison		27.11
" 13	1077	H. F. Williams		9.65
" 13	1078	N. J. Colman		17.00
" 13	1079	J. L. Christian		26.50
" 13	1080	F. I. Vandeventer		8.00
" 13	1081	Athens Hotel		8.00
" 13	1082	B. H. Ozment		35.00
" 13	1083	A. J. Glover		50.00
" 13	1084	Jake Moseley		2.00
Feb. 2	1085	S. H. Elkins		40.00
" 2	1086	J. C. Whitten		23.48
" 2	1087	S. M. Jordan		202.38
" 2	1088	A. T. Nelson		25.55
" 2	1089	M. J. Mallery		1.00

FARMERS' INSTITUTE FUND—Continued.

Date.	War. No.	Name.	Dr.	Cr.
1909.				
Feb. 2	1090	By American Express Co		$7.70
“ 2	1091	John Deerwester		14.15
“ 2	1092	Geo. W. Williams		21.74
“ 2	1093	F. G. King		115.56
“ 2	1094	J. W. Boles		10.75
“ 2	1095	M. F. Miller		9.37
“ 2	1096	W. H. Chandler		24.72
“ 2	1097	S. H. Elkins		8.60
“ 2	1098	Columbia Statesman		16.00
“ 2	1099	Sanford McSmith		14.00
“ 2	1100	M. V. Carroll		2.00
“ 2	1101	Col. Telephone Co		14.75
“ 2	1102	F. B. Mumford		22.78
“ 2	1103	Barnes-Crosby Co		66.47
Mar. 1	1104	M. F. Miller		22.20
“ 1	1105	National Paper Co		10.00
“ 1	1106	F. B. Mumford		27.12
“ 1	1107	J. C. Whitten		27.65
“ 1	1108	A. J. McDowell		41.44
“ 1	1109	J. B. Rector		15.00
“ 1	1110	C. B. Hutchison		35.41
“ 1	1111	S. M. Jordan		196.31
“ 1	1112	S. H. Elkins		37.50
“ 1	1113	Columbia Statesman		5.00
“ 1	1114	F. G. King		124.59
“ 1	1115	Ilena Bailey		16.79
“ 1	1116	G. W. Williams		75.88
“ 18	1117	Barnes-Crosby Co		4.75
“ 18	1118	S. M. Jordan		17.01
“ 18	1119	A. J. McDowell		40.52
“ 18	1120	O. E. Reed		34.44
“ 18	1121	Columbia Club		3.00
“ 18	1122	Farnsworth-Childs Co		10.00
“ 18	1123	H. J. Waters		7.33
“ 18	1124	J. W. Waller		12.85
“ 18	1125	C. H. Eckles		9.69
“ 18	1126	Barnes-Crosby Co		14.85
“ 18	1127	H. D. Hughes		21.27
“ 31	1128	Barnes-Crosby Co		7.51
“ 31	1129	Count Harvey		17.04
“ 31	1130	T. W. Whittle		24.25
Apr. 15	1131	Columbia Statesman		21.50
“ 15	1132	Barnes-Crosby Co		4.95
“ 15	1133	Pacific Express Co		20.38
May 3	1134	Barnes-Crosby Co		21.22
“ 3	1135	T. W. Whittle		10.00
“ 19	1136	S. M. Jordan		1.50
“ 19	1137	Barnes-Crosby Co		15.50
“ 19	1138	F. G. King		28.68
“ 19		To requisition	$500.00	
June 8	1139	By Barnes-Crosby Co		56.50
“ 8	1140	Scurlock Transfer Co		3.64
July 1	1141	S. M. Jordan		150.00
“ 30	1142	E. A. Remley		42.50
“ 30		To requisition	500.00	
“ 30	1143	By S. M. Jordan		150.00
Sept. 2	1144	S. M. Jordan		187.05
“ 2	1145	Geo. B. Ellis		123.30
“ 2	1146	F. H. Demaree		15.22
“ 2	1147	F. G. King		12.89
Oct. 6	1148	J. C. Whitten		23.80
“ 6	1149	W. H. Chandler		5.41

FARMERS' INSTITUTE FUND—Continued.

Date.	War. No.	Name.	Dr.	Cr.
1909.				
Oct. 6	1150	By M. F. Miller		$24.31
" 6	1151	E. A. Remley		20.00
" 6	1152	S. M. Jordan		239.63
" 6	1153	American Express Co		7.89
" 6		To requisition	$1,000.00	
" 16	1154	By Geo. D. Barnard Co		48.00
" 16	1155	F. H. Demaree		8.70
" 16	1156	A. J. McDowell		122.30
Nov. 3	1157	C. M. Long		32.76
" 3	1158	S. M. Jordan		213.74
" 3	1159	W. L. Howard		11.05
" 3	1160	A. J. McDowell		98.24
" 3	1161	E. A. Remley		17.00
" 3	1162	American Express Co		11.85
" 3	1163	W. H. Chandler		14.25
Dec. 6	1164	C. M. Long		110.79
" 6	1165	S. M. Jordan		248.94
" 6	1166	C. B. Hutchison		40.73
" 6	1167	Pacific Express Co		14.02
" 6	1168	A. J. McDowell		52.31
" 6	1169	W. H. Chandler		37.10
" 6	1170	F. H. Demaree		30.03
" 6	1171	Geo. W. Williams		129.96
" 6	1172	H. D. Hughes		14.29
" 6	1173	R. D. Calkins		66.96
" 6	1174	F. H. Hillman		50.28
" 6	1175	E. A. Remley		24.00
" 6		To requisition	1,500.00	
" 6	1176	By Geo. B. Ellis		38.06
" 28		By balance		957.42
			$6,866.48	$6,866.48

SUMMARY OF SECRETARY'S FINANCIAL STATEMENT.

DISTRIBUTION OF ANNUAL REPORT FUND.

Date.		Dr.	Cr.
December 15, 1908	To balance in treasury Board of Agriculture		
April 1, 1909	To amount of appropriation	$8,000.00	
Dec. 15, 1908, to Dec. 28, 1909	By warrants drawn for distributing of annual report		$500.00
	By amount paid for printing and binding annual report. Account with printing commission		3,387.09
December 28, 1909	By balance in State treasury		4,112.91
		$8,000.00	$8,000.00

MONTHLY CROP REPORT FUND.

Date.		Dr.	Cr.
Dec. 15, 1908	To balance in our treasury	$146.47	
April 1, 1909	To amount of appropriation	3,000.00	
Dec. 15, 1908, to Dec. 28, 1909	By warrants drawn on treasurer Board of Agriculture		$1,072.81
	By amount paid for printing bulletins, account with Printing Commission		797.80
Dec. 28, 1909	To overdraft treasurer Board of Agriculture	26.34	
Dec. 28, 1909	By balance State Treasury		1,302.20
		$3,172.81	$3,172.81

EXPENSE OF MEMBERS FUND.

Date.		Dr.	Cr.
Dec. 15, 1908	To balance	$294.30	
April 1, 1909	To appropriation	1,200.00	
Dec. 15, 1908, to Dec. 28, 1909	By vouchers paid		$545.81
Dec. 28, 1909	By balance with our treasurer		248.49
Dec. 28, 1909	By balance with State Treasurer		700.00
		$1,494.30	$1,494.30

FARMERS' INSTITUTE FUND.

Date.		Dr.	Cr.
Dec. 15, 1908	To balance	$1,366.48	
Dec. 16, 1908	To requisition	2,000.00	
April 1, 1909	To appropriation	10,000.00	
Dec. 15, 1908, to Dec. 28, 1909	By vouchers paid		$5,909.06
Dec. 28, 1909	By balance with our treasurer		957.42
	By amounts paid for printing bulletin, account with Printing Commission		143.41
Dec. 28, 1909	By balance with State Treasurer		6,356.59
		$13,366.48	$13,366.48

OFFICE EXPENSE FUND.

Date.		Dr.	Cr.
Dec. 15, 1908	To balance	$99.32	
April 1, 1909	To appropriation	1,000.00	
Dec. 15, 1908, to Dec. 28, 1909	By vouchers paid		$443.21
Dec. 28, 1909	By balance with our treasurer		56.11
Dec. 28, 1909	By balance with State Treasurer		600.00
		$1,099.32	$1,099.32

STATE VETERINARY FUND.

Date.		Dr.	Cr.
Dec. 15, 1908	To balance	$600.82	
April 1, 1909	To appropriation	23,200.00	
Dec. 15, 1908, to Dec. 28, 1909	By vouchers paid		$10,701.47
Dec. 28, 1909	To overdraft treasury of Board of Agriculture.	100.65	
Dec. 28, 1909	By balance in State Treasury		13,200.00
		$23,901.47	$23,907.47

STATE HIGHWAY ENGINEER FUND.

Date.		Dr.	Cr.
Dec. 15, 1908	To balance	$645.51	
April 1, 1909	To appropriation	12,000.00	
Dec. 16, 1908	To requisition	1,000.00	
Dec. 15, 1908, to Dec. 28, 1909	By vouchers paid		$6,604.97
	By amount paid for printing bulletins, account with Printing Commission		279.13
Dec. 28, 1909	By balance in our treasury		540.53
Dec. 28, 1909	By balance in State Treasury		6,220.88
		$13,645.51	$13,645.51

APIARY INSPECTION FUND.

Date.		Dr.	Cr.
Dec. 15, 1908	To balance	$71.59	
April 1, 1909	To appropriation	2,000.00	
Dec. 15, 1908, to Dec. 28, 1909	By vouchers paid		$982.74
Dec. 28, 1909	By balance in our treasury		88.85
Dec. 28, 1909	By balance in State treasury		1,000.00
		$2,071.59	$2,071.59

TREASURER'S REPORT.

To the State Board of Agriculture:

I, W. A. Bright, Treasurer of the Board of Agriculture, submit the following report of the amount of money received from last report, and from the State Treasurer, including balances, and the amounts paid out on warrants presented against the several funds of the Board of Agriculture, and the balances now on hand, all for the year ending December the 28th, 1909:

PRINTING OF ANNUAL REPORT.

Date.		Dr.	Cr.
Dec. 17, 1908	By overdraft		$ .10
Aug. 7, 1909	To State warrant	$300.00	
Sept. 10, 1909	State warrant	200.00	
Dec. 24, 1909	By warrants paid and cancelled		500.00
Dec. 24, 1909	To overdraft	.10	
		$500.10	$500.10

MONTHLY CROP REPORT.

Date.		Dr.	Cr.
Dec. 17, 1908	To balance	$146.47	
Dec. 17, 1908	Interest	.01	
July 6, 1909	To State warrant	200.00	
July 13, 1909	State warrant	100.00	
Aug. 7, 1909	State warrant	100.00	
Sept. 10, 1909	State warrant	100.00	
Oct. 25, 1909	State warrant	200.00	
Nov. 10, 1909	State warrant	200.00	
Dec. 24, 1909	By warrants paid and cancelled		$1,072.81
Dec. 24, 1909	To overdraft	26.33	
		$1,072.81	$1,072.81

EXPENSE OF MEMBERS FUND.

Date.		Dr.	Cr.
Dec. 17, 1908	To balance	$294.30	
July 6, 1909	To State warrant	200.00	
Oct. 15, 1909	State warrant	100.00	
Dec. 16, 1909	State warrant	200.00	
Dec. 24, 1909	By warrants paid and cancelled		$537.31
Dec. 24, 1909	Balance		256.99
		$794.30	$794.30

FARMERS' INSTITUTE FUND.

Date.		Dr.	Cr.
Dec. 17, 1908	To balance	$1,518.83	
Dec. 23, 1908	State warrant	2,000.00	
July 6, 1909	State warrant	500.00	
July 7, 1909	State warrant	500.00	
Oct. 15, 1909	State warrant	1,000.00	
Dec. 16, 1909	State warrant	1,500.00	
Dec. 24, 1909	By warrants paid and cancelled		$6,047.12
Dec. 24, 1909	Balance		971.71
		$7,018.83	$7,018.83

OFFICE EXPENSE FUND.

Date.		Dr.	Cr.
Dec. 17, 1908	To balance	$99.32	
July 6, 1909	State warrant	100.00	
Sept. 10, 1909	State warrant	200.00	
Dec. 16, 1909	State warrant	100.00	
Dec. 24, 1909	By warrants paid and cancelled		$429.08
Dec. 24, 1909	Balance		70.24
		$499.32	$499.32

STATE VETERINARY FUND.

Date.		Dr.	Cr.
Dec. 17, 1908	To balance	$600.82	
July 6, 1909	State warrant	4,000.00	
July 13, 1909	State warrant	1,000.00	
Aug. 7, 1909	State warrant	1,500.00	
Sept. 10, 1909	State warrant	500.00	
Oct. 16, 1909	State warrant	2,000.00	
Nov. 10, 1909	State warrant	1,000.00	
Dec. 24, 1909	Balance		$8.32
Dec. 24, 1909	By warrants paid and cancelled		10,592.50
		$10,600.82	$10,600.82

APIARY INSPECTION FUND.

Date.		Dr.	Cr.
Dec. 17, 1908	To balance	$71.59	
July 13, 1909	State warrant	200.00	
Sept. 10, 1909	State warrant	300.00	
Oct. 15, 1909	State warrant	200.00	
Dec. 16, 1909	State warrant	300.00	
Dec. 24, 1909	By warrants paid and cancelled		$982.74
Dec. 24, 1909	Balance		88.85
		$1,071.59	$1,071.59

STATE HIGHWAY ENGINEER FUND.

Date.		Dr.	Cr.
Dec. 17, 1908	To balance	$645.51	
Dec. 21, 1908	State warrant	1,000.00	
July 6, 1909	State warrant	2,500.00	
July 13, 1909	State warrant	500.00	
Aug. 7, 1909	State warrant	500.00	
Sept. 10, 1909	State warrant	500.00	
Nov. 10, 1909	State warrant	500.00	
Dec. 16, 1909	State warrant	1,000.00	
Dec. 24, 1909	By warrants paid and cancelled		$6,604.98
Dec. 24, 1909	Balance		540 53
		$7,145.51	$7,145.51

Respectfully submitted,
W. A. Bright,
Treasurer.

REPORT OF STATE HIGHWAY ENGINEER.

Columbia, Mo., December 28, 1909.

To the Honorable Members of the State Board of Agriculture:

Gentlemen—In my report for the year, 1908, among other things planned for the year, 1909, I mentioned a systematical study of the road materials of the State, a census for the amount of travel, whereby the roads could be classified, the collection of historical data upon the old State roads, and the tests of paints and preservatives for steel highway bridges. These plans had to be abandoned because of an insufficient appropriation. The appropriation by the last Legislature for the biennial period is not sufficient to carry on the regular routine work of the office for the two years, aside from gathering useful information or broadening the scope of our work. The office is constantly receiving calls, the nature of which requires visits to the localities. In order to treat all alike, after April 1st, we shall be compelled to request that necessary traveling expenses be provided by the community or local authorities desiring such services. With very little more funds, the work of the office could be made many times more valuable to the State. The prospect for the next year is not to enlarge, but to curtail the work.

DUTIES OF THE STATE HIGHWAY ENGINEER.

The duties assigned by law for the State Highway Engineer are to devise plans and estimates for road and bridge construction, best suited to the needs of the different counties of the State; to hold public meetings in the various parts of the State, and to give assistance and advice to local road officials whenever any of said officials may request it; to disseminate information and instructions by bulletins, publications, etc.; to assist in the construction of demonstration roads, and to investigate the character of the different road materials of the State.

For the first of these duties, the office has made plans and estimates by actual study and survey of the ground of something like seventy miles of rock and gravel road, a few miles of which were superintended during construction by the office. This does not include plans, estimates, or specifications sent out from surveys made by local engineers. We have made plans and estimates for fifty-four steel bridges aggregating 6,650 linear feet, and 123 concrete structures aggregating 1,420 linear feet, the total amounting to 177 bridge plans and 8,070 linear feet of bridging at an estimated cost of approximately $190,000.00.

In holding public meetings and in advice and assistance given local officials, representatives of the office have made 250 visits for the purpose of holding, or assisting to hold, road meetings, and for advising upon road and bridge matters. Many of these meetings have been strictly road gatherings, while in some the road question was discussed in conjunction with other subjects, such as farmers' institute work. All of this is aside from the hundreds of inquiries answered by mail.

Nine bulletins and several circulars have been issued. These relate to the different manner and forms of road and bridge construction, and aid in securing uniformity of methods, system and organization in road work and road expenditures.

I have not been called upon to superintend the construction of any demonstration road. I have put on six demonstrations during the two years, and these only in a small way, for the purpose of illustrating some feature of work adaptable to that particular locality. Two of these demonstrated the use of the road drag for maintaining gravel roads, especially upon newly made roads, without the use of a road roller, and where the gravel is packed by travel. In Cape Girardeau county, where the County Highway Engineer, Mr. Scivally, worked earnestly in conjunction with us, the drag is now being used successfully to help maintain the gravel roads.

I believe that almost every section of the State contains some kind of road-making material which can be found by well directed research. For example, by a personal investigation in a certain locality of the State, I found an excellent road gravel in abundance where the people were under the impression that they had no material with which to make roads.

Again, we have a large area of low lands in Southeast Missouri, which is generally supposed to be without material. They have sand and an excellent quality of gumbo. One year ago I made a campaign of three weeks in that section upon the sand-gumbo road. I repeated the campaign last March with the aid of an engineer from the United States Office of Public Roads, with the result that Mr. Ellis, Highway Engineer of Mississippi county, succeeded in building a mile of this particular road last August. This has since been followed by a mile in Scott county by Mr. Warner, County Engineer. It is attracting considerable attention, and is the opening wedge for better roads, at a reasonable price, in a section where the cost of imported material almost prohibits hard roads.

These things are small in themselves, but next to a general desire are the first steps toward acquiring good roads, but there is some expense attached even to this.

You will all realize that my work is of such a nature that its value cannot be estimated in dollars and cents. With a rating at the usual fees charged for engineering consultation the amount will just about balance the expenditures upon the office. This estimate does not nor cannot take into account the loss which might have occurred through faulty construction, since without such an official as State Engineer, the local officials would never have sought advice upon the subject, nor does it take into account the far reaching effect which the road meetings, publications, and other similar works may have.

For example, we have not only made the plans for concrete structures, but have in some instances gone to the county where no such work had been done, and aided in preliminary construction. In four cases we went before the county courts and argued for a beginning in concrete culvert work. These, among other counties, are now doing concrete work as fast as their means will justify.

Six years ago Dallas county paid $4,450.00 for a 120-foot steel bridge with approaches. Under our plans, by rejecting bids and reletting, a similar bridge was built last year for $2,750.00. In the adjoining county of Polk where a similar condition existed, a contract was closed upon our plans and by our advice in which all bids were rejected two different times, the first received being over $5,000.00. The contract price was finally closed for $2,650.00 or about one-half that paid by the county for the same sized structure a few years ago, and a little more than one-half the amount of the lowest bids first received.

We constructed six miles of rock road for one county this year at an average contract price of $4,200.00 per mile, exclusive of grading. A few other roads have been built in that vicinity, under similar conditions, which cost $5,000.00 per mile. This reduction in cost is due to the difference in plans and methods for construction, and we have as good a road for the less cost.

These examples will not apply throughout the State, nor is the value of the State office altogether in reducing the cost of work. In some cases we have increased the cost. We have changed details of numbers of plans which were sent to us for advice, which neither increased nor decreased the cost of the work, but give better work for the same cost.

PERMANENCY OF CONSTRUCTION.

Approximately, $3,000,000 was spent upon the roads of the State last year, divided about equally between improved roads, the earth roads and bridges and culverts. Of these three millions of dollars of expenditure, about $310,000 was for culverts (structures less than 10 feet clear span). As you all know, many of these structures are made of timber, and are always dangerous, rotting out, or having to be renewed. Of this $310,000, 41 per cent. was for repairs and maintenance. Any method of culvert construction which costs 41 per cent. of the annual expenditures for repairs, is wrong. The counties cannot spend their road revenue to better advantage than for concrete culverts. We must build more permanent structures with public road funds.

The State has approximately 110,000 miles of road, 5,000 miles of which may be classed as improved, leaving 105,000 miles of earth roads. This 5,000 miles of improved roads consists of various degrees and manner of improvements, many miles of which are poorer than a good earth road with good concrete culverts. The term "good roads," is a relative term, and what is considered and reported as an improved road in some sections would be called a very poor road in another. Missouri has a small mileage of modern, first-class, up-to-date roads. All of which again calls to mind the lesson that could be taught with demonstrations and a few sample roads.

MAINTENANCE OF THE STATE HIGHWAY DEPARTMENT.

Good roads, in by far the larger part of the State, is a matter of education. It is a question of teaching the people to know good roads, thus creating a desire for them. This is of interest to the State, and is as much a problem for the State as for the community. The State could not spend a few thousand dollars to better advantage than to supply the State Engineer with means to make demonstrations and to build sample roads.

An annual State license could be placed upon automobiles, the proceeds of which should be used solely for the support of the State Highway Engineer's office. This license could be made sufficient to permit an investigation of road materials and to make demonstrations. It would also put the office upon a better footing.

STATE AID TO ROAD BUILDING.

The last Legislature passed a resolution submitting a constitutional amendment for a State road tax of 5 cents on the $100.00 worth of assessed valuation. I urge the adoption of this amendment, that through State aid there will be an inducement for the improvement of our road system, a stimulus for the construction of permanent highways, and because it is an equitable plan for road improvement. If some broad policy were definitely adopted whereby the cost of making roads would be proportioned between the community, county and State, a creditable showing would soon be made without working a hardship upon anyone. Examples can be cited in the counties of Johnson, Cass, Boone, Cooper, Clay, Platte, Montgomery, Nodaway, Holt, Callaway, Pettis, Saline, Jefferson, Scott, Douglas, Greene, where the communities or districts desiring to build, felt that the total cost was too much for them, but with a little financial assistance would have gone ahead with the work. This, in turn, would bring further improvements. Missouri will succeed in road work whenever she acquires State aid for public roads.

THE COUNTY HIGHWAY ENGINEER.

There is a great deal of talk against the office of County Highway Engineer. Under the last legislative action, petitions are being circulated in a few counties for the purpose of suspending the County Highway Engineer act, while one county has already voted in favor of the suspension clause.

The law creating the office of County Highway Engineer is good and is sound in principle. If any county does not improve road conditions under it, it is the fault of the county, and not of the law. If every man would acquaint himself with the loose methods of the past forty years, namely, the condition of our road records, the utter disregard for road laws and road regulations, the counties' mercy at the hands of the unscrupulous contractors, and the unsystematical ways in vogue, he would certainly see the necessity for the office of County Highway Engineer. The county engineer can, in many places, collect more of the poll-tax than was collected before him, get the funds upon the road at a less percentage for overseeing, and can gradually bring order out of chaos.

Take, for example, the cases of Lawrence and Moniteau counties, where the cost of overseeing was formerly about 50 per cent. of the funds; the engineers have reduced it to 20 per cent. and 30 per cent., respectively. In one district in another county, it was costing 97 per cent. of the funds to get them on the road. With the same overseer, the engineer succeeded in reducing this to 40 per cent. the first year, and to 30 per cent. this year. One other county shows 30 per cent. saved in the purchase price of road tools alone, and in still another, where only 50 per cent. of the poll-taxes were ever collected, through the attention and spur given the road interests by the engineer, 90 per cent. of these taxes are now collected.

The amount of work for which the engineer is called upon, is evidence enough of the need for such an official. The county court of

Greene county have signed a volunteer statement to the effect that the County Highway Engineer fills a long felt want, and that the position saved $4,000.00 in different ways to Greene county in the year 1908.

The cost of the County Highway Engineer to the county is not greater, in many instances, than the sum of the fees paid out under the old fee system. Take, for example, the county of Buchanan, where this year the amount of salaries paid into the County Highway Engineer's office was $4,400.00, and the year preceding the advent of the County Engineer the fees for road supervision cost the county $4,608.00. In Chariton county the salary of County Highway Engineer is $2,000.00. while the last year before the engineering supervision the fees paid the ex officio road and bridge commissioner were $2,194.00. In Johnson county a similar comparison shows the fees under the last year of the old law to have been $1,550.00, the County Highway Engineer's salary is $1,200.00. In Pettis county the fees were $1,280.00 and salary of engineer is $1,400.00. In Mississippi county the fees were $1,330.00 and salary of the engineer is $900.00. In Scott county the fees for road supervision averaged over the seven years preceding the County Highway Engineer act, $1,730.00, not including fees of records of several instances where special commissioners were employed. The County Engineer's salary is $1.500.00. Besides this, the engineer has the supervision of road and bridge work, of the overseers, of the surveying, ditching and clearing of the right-of-way, and a number more of other duties are required of him than were required of any man under the old system, or ever will be required of an ex officio County Highway Engineer. His whole time and attention is required upon the county's roads, for which the county is paying but little or no more than it formerly paid out in fees for inferior service. And, furthermore, the pay of the county engineer does not keep the amount of his salary from the roads, because he is paid out of the county funds, as any other county officer is paid. and not from the road funds.

A STANDARD OF QUALIFICATIONS FOR HIGHWAY ENGINEERS.

Unfortunately, some of our highway engineers are not qualified to hold their office. We should have an examining board, competent to judge and fix a standard of highway engineers, and require each engineer to obtain a license from this board.

A CASH SYSTEM OF ROAD TAXES AND REGULARLY ORGANIZED ROAD CREW.

We should do away with the labor tax system. The working out of taxes is an inadequate, inefficient and indefensible form of revenue. We must substitute a cash system and road workers with competent supervision. The men who work out their taxes, as a rule, know nothing and care but little about the work. Many of them work with the sole idea of working out the taxes, not to benefit the roads. It is not so much the fault of the men as it is the fault of the system, a ''venerable'' system which has been handed down from generation to generation, but which has become rotten with age.

In the first place, it is difficult to get men to serve as road overseers. We must depend upon the farmers to fill these positions—men whose living and business is farming, not making roads. They, even as overseers, cannot be expected to give the roads due attention at times when roads should be worked, considering that they are as competent road men as they are farmers. Their farms have first call upon their time, attention and study.

We should have a few men in each county whose business is working roads; men who make it a business, men who have an organization, and who are prepared for it as a business. They will accomplish more with one dollar than the average overseer can with two. These road crews should be under the direction of the county engineer, to be sent any place in the county where necessary, such as the districts where we have incompetent overseers or none at all, or where a good overseer requires aid, or where work can be put directly under the engineer. One or two such crews could be kept busy in a county the entire year, and additional crews could be put on in the proper working season. It need not mean the abolishment of the overseer system where good men can be secured to act, but one good outfit, with a competent foreman, to a township, or to 50 or 100 miles of road, would accomplish something in a year's time. It is doubtful if it would cost any more than under the present methods, but even if it should, it will bring results.

Furthermore, the business for this crew of road workers will be to care for the roads while other people are attending to their own business, for as long as road work is everybody's business, it will be poorly done. Road affairs being everybody's business, together with politics, causes more loss and poorer work upon the roads than all the other things together, for the inevitable result is incompetency or loose methods.

THE ELIMITATION OF POLITICS FROM ROAD AFFAIRS.

Another indication of rottenness in our ''venerable system,'' is the infusion of politics into road affairs. The roads do not belong to any party, set, or faction, but are the property of all. In some of our counties the road affairs are nothing more than a political machine. More than one instance can be pointed out where the roads have been made to suffer in order to reward a political henchman. This can never be entirely eliminated from the business, but a healthy public sentiment for the selection and the retention of men for their fitness for the work rather than for their political affiliations, will be helpful.

THE EARTH ROAD.

Road dragging last year was not, on the whole, kept up to the standard of former years. The season was discouraging, but our attempt to place road dragging under supervision and upon a cash contract basis, checked the work. Our plan is to grade a continuous piece of road, then to contract with parties living along the road, to drag it. This has met with a surprising number of obstacles in one way or another. In some cases, the engineer or overseer was not permitted to pay a sufficient price to cover the expense of dragging. Others oppose it because they do not believe in the efficiency of the drag. Numerous instances have come to my notice where a long stretch of road was being dragged with one or more undragged sections in it. When the engineer would contract to have these poor sections dragged, many quit who were dragging voluntarily, and then would not contract for the work. The greatest difficulty in contracting the dragging has been to get citizens who will do the work. It has been impossible to make contracts—neither will the citizens keep it up properly as volunteer work. Volunteer dragging can never be more than temporary, and it must be solved, either by contract (or payment for the work), or else by a law, compelling every property holder to drag his road a required number of times under the direction of the road officials.

I shall here reiterate my oft-repeated assertion that we should give closer attention to the earth road. The largest road mileage of the State will be earth roads for a long time to come, even at a very rapid progress in road building, and in the meantime the best possible should be made of the earth roads. Well-maintained roads, with good bridges and culverts, will solve the greatest problem in our road difficulties.

RAILROAD RATES.

I desire to mention a recent action upon freight rates for Missouri on road materials and machinery by the Chicago & Alton and the Chicago, Burlington & Quincy railroads. About the middle of October, the Chicago & Alton announced that that road would put into effect a tariff of one-half cent per ton per mile, car load lots, on road material and machinery, provided the shipment is without profit, and is billed to road officials. About December 1st, the C., B. & Q. R'y announced that they were willing to publish the same rates under the same conditions. This rate is the actual cost of transportation by rail over these roads, and is an expression of the friendly disposition of these roads toward highway improvement in the State. Credit for acquiring this tariff should be given more to Frank W. Buffum of Louisiana, Mo., than to any other individual in the State. He has been working upon this particular matter for two years.

SUMMARY.

A summary of the main points in this report is: Give the vital interest of road betterment financial support and a front rank in affairs where it belongs; raise the standard of road work and road workers, take them out of the category of dog-catchers, and thereby create a more wholesome respect for the roads and the road laws; cash taxes; better the working system by organization of road work; State aid and close supervision. I might add in conclusion that cash taxes, State aid and competent supervision is the prescription for good roads.

Yours truly,
CURTIS HILL,
State Highway Engineer.

REPORT OF STATE VETERINARIAN.

Mr. President, and Gentlemen of the Board of Agriculture:

The work of the Veterinary Department was greatly handicapped during the past year by the lack of funds. At least five more men should have been available for the veterinary service. In order to cover the ground at all, it was necessary to leave the control of hog cholera almost entirely to the Experiment Station, and to omit investigations of all outbreaks of contagious diseases which did not threaten immediate and heavy losses. In cases of outbreaks of scab among sheep we simply took the matter up through correspondence, and did the best we could in that way. Of the thirteen outbreaks of lip and leg disease of sheep, we were able to thoroughly investigate but one. A serious disease among horses and mules in parts of southwest Missouri was left without any investigation whatever. In all probability this disease is what is known as infectious anemia. In view of the fact that it is of a serious nature, and may become wide-spread, it would certainly be worth while for the State to provide sufficient means for its investigation and suppression. There were many other matters of more or less importance that were neglected simply from the fact that there were no funds with which to employ sufficient force of competent men. In the event of a general outbreak of any serious contagious disease of live stock, our present force would be entirely inadequate to protect the State from its ravages. We are by no means prepared to safe-guard the health of the live stock in the manner that it should be done in a great live stock producing State like ours.

Personally, I have attended to the office work, lectured at farmers' institutes, and done as much as possible of the tuberculin test work. In addition to planning and superintending the Texas fever, and all other control work, I spent over three months of the past summer in the field assisting in spraying cattle for the eradication of Texas fever ticks from cattle. Concerning the control work attempted, I beg leave to report of each disease separately, as follows:

SCABIES.

During the year we had official information of thirty-four outbreaks of scabies among sheep in this State. There were probably a few other outbreaks concerning which we had no information.

As has been the case for several years past, we have found that nearly all of the outbreaks of scab are among bands of sheep shipped into this State from the west for stock purposes. Compared to the vast traffic in western sheep, the number of outbreaks is very small, and indicates an accurate and rigid inspection by the Federal Department, and good work on the part of the authorities in the western states in the eradication of scabies.

Whenever we have learned of the existence of scab among sheep anywhere in the State, we have simply written the owner, enclosing a copy of section 2330, R. S. 1899, which forbids the sale, shipment, or movement, on the public highway, of sheep affected with any contagious disease. We have also sent each owner of infected sheep a bulletin on the diseases of sheep, in which is given the treatment for scab. This is by no means a thorough manner of controlling sheep scab, but is the best we could do with our limited veterinary force.

FOOT ROT.

There were only five outbreaks of foot rot called to our attention during the past year. Except for the fact that there was none of this disease in the State up to about two years ago, this would be a matter of little importance. We have followed the same course in dealing with outbreaks of foot rot as of scab, and for the time being there seems to be no imminent danger of extensive losses from this disease.

LIP AND LEG DISEASE (NECRO-BACILLOSIS).

Of the thirteen outbreaks which were known to have existed in this State, all were among sheep imported from the west.

Only one outbreak was investigated. This was a lot of western sheep bought at Omaha by two farmers in Randolph county, Mo. The lot consisted of about 350 head, and was divided between the two. Out of 200 head kept by one party, there were seventy-seven either dead or had to be destroyed. This investigation indicates that lip and leg disease of sheep is a much more serious matter than it is generally regarded by the owners of sheep ranches in the west. For several years a mild type of sore mouth has been prevalent among sheep on the ranches. There is a tendency to confound that mild type of disease with the present lip and leg disease. These two diseases may be the same, and the more fatal symptoms shown by sheep this year may be due to some peculiar climatic conditions. Until that fact is definitely settled, the State should be carefully guarded against the introduction of the disease.

Under the impression that lip and leg disease is of a harmless nature, feeders are asking for the privilege of taking diseased sheep from the public stock yards for feeding under quarantine. Section 2330, R. S. 1899, forbids such a practice, and in my opinion, the disease is of such a serious nature as to warrant the State enforcing this statute to the letter.

GLANDERS.

The usual course was pursued in dealing with outbreaks of glanders. Most favorable results have followed, except in Kansas City, where the dangerous watering fountain is still in use. During the twelve months preceding December 1st, there were in the entire State 103 outbreaks of glanders, with 116 animals affected. The affected horses were distributed as follows: In Kansas City, sixty-seven; St. Louis, twenty-three; in the balance of the State, twenty-six. There were eighteen more glandered horses found in Kansas City than all the rest of the State, including St. Louis, and the prevalence of glanders there is doubtless largely due to the type of watering trough in use. The results of our investigations continue to show the necessity of abolishing these troughs, as was recommended to the authorities of Kansas City, and to this Board some years ago.

HOG CHOLERA.

The control of hog cholera was left to the Veterinary Department of the Experiment Station, in charge of Dr. J. W. Connaway. The last Legislature made an allowance of $10,000 for the preparation and use of the hog cholera serum by the Experiment Station. I am informed that this amount was insufficient, and that the station was able to answer only about one-half of the calls for assistance which it received. I have personally visited a number of counties where hog cholera was quite wide-spread, and from which no calls had been sent to the station. It is reasonable to infer that not more than one-third of the outbreaks of hog cholera in the State were taken care of during the past year.

In order to prevent the spread of hog cholera from infected herds, perfect organization is absolutely necessary. I would recommend that the Board of Agriculture co-operate with the Experiment Station with the view to securing the necessary funds for preparing hog cholera serum, and thereby secure a supply for use by the deputy state veterinarians over the State. I suggest that these deputies be constantly supplied with serum, and placed in a position to take charge of any outbreak of hog cholera that may exist in their respective sections of the State. As I suggested in my last annual report, there would only be a few hours, and in no case more than twenty-four hours elapse between the beginning of an outbreak of cholera, and the arrival of a deputy to take charge of it. In addition to immunizing the hogs which are found still unaffected, a deputy with official authority could round up the diseased animals, and keep them in such quarantine as to prevent the spread of the disease from them to the neighboring farms. Without this latter authority, immunizing work is bound to be far from perfect. This plan was recommended by the Chief of the Bureau of Animal Industry, under whose supervision the discovery of the hog cholera serum was made.

TEXAS FEVER.

Texas fever infection was quite prevalent in Ripley, Oregon, Newton, and McDonald counties. Ripley county was in absolute quarantine and cattle were not allowed to move until after November 1st, even by inspection. The southern fourth of Oregon county, and the western third of Newton and McDonald counties were in quarantine, but movement of some cattle was permitted on inspection. Our work during the summer showed 275 lots of cattle in Ripley county, seventy-seven in Oregon county, 238 in McDonald county, and ninety-five in Newton county. These numbers do not include all the owners of milk cows in Doniphan, Thayer, Southwest City, Neosho, and Seneca.

With the view of completely eradicating the fever ticks from these counties, and getting the quarantine removed, we put our whole force to work on tick eradication early in the spring, and continued the work until December 1st. In addition to the regular force we employed an additional inspector each, for Oregon and Ripley counties. Dr. L. D. Brown was placed in charge in Newton county; Dr. H. C. Tuck in McDonald county; Mr. W. A. Norman in Oregon county; and I took personal charge in Ripley county, and was assisted on the part of the State by Mr. J. E. Taylor. The Federal Government, out of their tick eradication appropriation, made by the last Congress, practically duplicated our force of men, and in addition furnished about 100 barrels of crude oil for use in spraying cattle. Of $10,350 available for the veterinary service for 1909, we spent $4,792.48 in our tick eradication work. The salaries and expenses of the Federal officers amounted to $5,731. The material furnished by the Federal Government amounted to $1,000.00. A total of $11,523.48 was spent during the last summer in tick eradication work. In Ripley county the emulsion and spray pumps were furnished free, and the inspectors assisted in the spraying, and supervised the work, so that all the cattle men had to do in any case was to drive their cattle to convenient stations on the regular spraying dates. In Oregon county the same provisions were made, with the exception that cattle owners were required to furnish the pumps. In Newton county practically the same arrangements were made as in Ripley county. In McDonald county the emulsion was supplied and the owners were required to get it and use it themselves. These various methods were tried for the reason that it was impossible to provide a sufficient force of men to attend to the spraying in McDonald county, and with the further idea in view of experimenting on the best method of tick eradication. Strange as it may seem, work in McDonald county apparently was most successful, and met with the least resistance. Indications are, that the more the State and Federal Government do for the owners of cattle, the more they expect. In many cases the owners regarded it as a personal accommodation to the inspectors when they drove their cattle to the stations for spraying, and some were entirely unwilling to do even this.

On account of lack of funds we will not be able to push this work under the same plans another year. The Federal Government will not more than duplicate the State force, and at best, we cannot possibly supervise the spraying in a thorough manner. At present, it appears that we will do well if we secure a supply of tick emulsion from the Federal Government for use in the various counties. Unless the way opens up for us to do better, we will simply have to be content with making an occasional systematic inspection, and enforcing the law which forbids owners of ticky cattle from allowing them to run at large. Just recently I have received a sample of Texas fever ticks sent in from Christian county, and the report indicates that these ticks are widespread in the vicinity of Chadwick. This will add to our work during the coming year.

The control and eradication of fever ticks has been made more difficult during the past two summers on account of the extremely mild winters preceding, and the further fact that a great deal of the outlying range was not burned off. As best the forecast could be made, there were some few ticks matured after September 1st, in localities in Newton and McDonald counties, next to the Oklahoma line; in Oregon county around Myrtle and Thayer, and in Ripley county, around Doniphan, and in the extreme northwest corner of the county. On account of the wet weather during the past fall, very little burning was done, and in all probability, the infection will reoccur in these localities next year.

TUBERCULOSIS.

At last tuberculosis eradication work has been reduced to a practical system. Previous to this year this work has been held back for the reason that there was no way to dispose of tuberculous cattle, without violating the law, and causing the owner an unjust loss. A law passed by the last General Assembly and approved by the Governor, April 16, 1909, provides that the State may grant partial indemnity for cattle condemned on account of tuberculosis, and that the owner may be permitted to ship such cattle, under proper restrictions, to market for immediate slaughter, under Federal or State inspection. In addition to the amount allowed by the State, the owner gets whatever the cattle bring on the market. As a rule, the owner will take a loss of about one-fourth or one-third of the value of the cattle condemned when they are shipped to market. He has the option of keeping tuberculous cattle in isolation, under the Bang system, for breeding purposes, in which event the State is out nothing for indemnity and the owner is out only the additional expense of keeping such cattle in quarantine. There is now no ground whatever for the objections which have heretofore existed against the tuberculin test, and made it so difficult to get the co-operation of the owners in doing accurate work.

Heretofore we have had to take advantage of any opportunity that presented itself to test herds. The result was that an undue amount of time and money was lost in traveling over the State. Hereafter we will attempt to group the work in such a way as to reduce the cost of inspection per herd to the minimum. As far as possible, we will group the herds as follows:

I. Those from which milk or butter is sold in any of the smaller cities of the State.

II. Those from which cream is sold to any creamery in the State.

III. Those from which milk is shipped to a milk dealer in either of the large cities—Kansas City, St. Louis, and St. Joseph.

We will insist on all herd owners in any one neighborhood getting ready at the same time.

As a beginning of this plan, Warrensburg, coming under Class I, has passed and put into force, an ordinance requiring, among other things, that its dairy herds be free from tuberculosis. One firm, out of about sixty-five, dealing in milk in the city of St. Louis, is having all the herds from which it purchases milk tested for tuberculosis, and the diseased animals removed therefrom. The work of testing these herds has been completed, with the exception of retesting one herd from which two diseased cows were removed on the last retest. Working under this plan, we are getting at least twice as much done as heretofore.

In all this work we have endeavored to verify the accuracy of the results of the test by post mortem examinations. Errors are possible in two ways. A cow that is not tuberculosis may be condemned, or one that is tuberculosis may be passed for sound. As far as we can possibly ascertain the facts, we condemned, in our tests of about 3,882 head up to December 1, 1908, only three animals in which lesions of tuberculosis plainly visible to the naked eye were not found. As best we can ascertain, we have passed only one animal for sound that should possibly have been condemned. We are taking every precaution to avoid errors, either in condemning sound animals or leaving tuberculous animals in the herd. All animals which react to the test are tagged with an ear tag bearing the words "Missouri Condemned, Tuberculosis," and a serial number. We offer to retest extremely valuable animals, if the owner desires it, before finally condemning them. We repeatedly retest every herd from which any diseased animals are removed; until we are sure that no diseased animal is left. As a rule, the second test shows the herd to be sound.

At present the indications are that the amount of tuberculosis eradication work which we do will be limited only by the small force of deputies our funds will permit us to employ. If we had an adequate force of men the matter of completely eradicating tuberculosis from among our cattle and hogs would be disposed of in an incredibly short time. The expenditure of a large amount of money in this work by the State would be justified merely for the purpose of stopping the spread of tuberculosis among live stock. However, when properly considered, this is a very small part of the total benefits to be derived. There are two other sources of even greater benefits, viz.: (1) The prevention of the infection of the human family through milk and meat, and (2) The education of the human family as to the essential principles governing the spread of tuberculosis.

Practically all scientists agree that bovine tuberculosis is transmissible to the human.

Circumstantial evidence supporting this view is overwhelming. My own tests, followed in many cases with post mortem examinations of the condemned tuberculous cattle, show that as a general rule the milk and butter consumed in our towns and cities is contaminated with tuberculosis. The loss of human life in our cities from bovine infection is beyond doubt very heavy, and the responsibility of stopping it promptly rests on the State Board of Agriculture.

With proper education the spread of tuberculosis in the human family can be stopped as promptly and successfully as we are actually stopping it among herds of cattle. There is no doubt that all necessary scientific information is now at hand, which, if properly applied, will stop all tuberculosis of men and animals. The education of the public then, becomes a matter of utmost importance. There is no other channel of education of the public as effectual as post mortem demonstration on tuberculous cattle combined with instruction covering the general principles governing the disease. The public instruction that can be given as incidental to the eradication of tuberculosis among cattle will, in my opinion, be of far more value to the State than the mere protection of cattle against this disease.

QUARANTINE REGULATIONS.

The protection of this State, by suitable quarantine regulations, against the importation of tuberculous cattle from other states has become imperative. A total of thirty-one states are now barring the introduction of tuberculous cattle. This leaves the remainder, of which Missouri is one, as a dumping ground for diseased cattle rejected by the other thirty-one states. A large number of shipments of cattle have been brought into, and promiscuously scattered over this State during the past year. The facts that these imported cattle are selling at far less than similar cattle, if sound, would bring either in this State or at their origin, and that they are coming largely from New York and Vermont, where probably one-third of all cattle are tuberculous, causes a grave suspicion that at least a large per cent of them are diseased with tuberculosis. Without restricting the importation of diseased cattle, our efforts at the eradication of tuberculosis among our own cattle will be of little value. The official reports of the U. S. Bureau of Animal Industry, and of the states, show that tuberculosis is prevalent among cattle in the states from which these importations are coming. I therefore recommend that the Board of Agriculture forthwith formulate suitable rules and regulations governing the importation of cattle, and that the Governor proclaim the same to be enforced with the least possible delay.

INVESTIGATIONS.

It has been impossible to thoroughly make the investigations that were proposed in my report for 1908. From the few additional facts which have come to hand during the past year, I am reasonably satisfied that both conditions exist. The practice of taking diseased cattle from our public stock yards for slaughter in plants not having meat inspection, and for addition to our dairy herds, has been a common practice for years, and at present, there is no restriction on this sort of traffic. The very nature of the traffic in stock cattle leaves no room for doubt that tuberculous cattle are being shipped into this State.

LEGISLATION.

As stated under the discussion of tuberculosis in this report, a law was passed providing for the prompt disposition of cattle diseased with tuberculosis. This law has been in force since August 16th, and is working satisfactorily to all concerned. It protects the owner, whose herd has unfortunately become diseased with tuberculosis, from excessive losses, and makes it possible for him to dispose of any diseased stuff promptly, and thereby rid his herd of tuberculosis. The State is protected from undue loss through the indemnity granted by the specifications of the law. This law requires that any animal for which indemnity is claimed should become diseased accidentally, and not through any human or gross or wilful neglect, or scheming on the part of the proprietor; that it was not already diseased when it came into the possession of the proprietor; that it did not come already affected with said disease from another State, or from any territory, or from any other county, and that it had not been exposed to disease outside of Missouri inside of three months prior to its importation into this State. These conditions thoroughly protect the State in the matter of allowing indemnity.

No attempt was made to secure the passage of a law authorizing the Board of Agriculture to put an inspector at each of the public stock yards in this State with authority to prevent the removal therefrom of diseased animals for slaughter, or addition to dairy herds. The necessity for the law conferring this authority on the Board of Agriculture is, in my opinion, very great.

Respectfully submitted,
D. F. LUCKEY,
State Veterinarian.

REPORT OF APIARY INSPECTOR.

Springfield, Mo., Jan. 19, 1910.

To the Honorable Members of the State Board of Agriculture:

Gentlemen—In presenting this, my annual report for the year of 1909, I wish first to call your attention to the fact that some additional help is greatly needed in the line of inspection work. The past season has demonstrated this need beyond question.

As was pointed out in my last year's report, this work could best be accomplished by special deputies appointed by the inspector for special work in diseased districts. In every community where disease exists, will be found a few individuals who are either too busy with other matters, or are too careless and indifferent to the rights of others, to treat their diseased bees without exposing the same to neighboring yards.

It is impossible for the inspector to stay and personally attend to all such cases, for he never could get over all his territory. But in nearly every community can be found some person who can be trusted to attend to such work, and who would be willing to donate a part of his time in order to get disease promptly treated in his neighborhood.

The important thing in this work is to get all the diseased colonies of a neighborhood treated as near the same time as possible, so that there will be no diseased ones left to spread the infection to healthy colonies, and those newly treated. The time required for this special work would not be great, and the expense could be made very light, but the results would be telling in the eradication of disease.

The total number of colonies inspected during the season of 1909 was 2,922, of which 151 were diseased. While the results in the inspection work have not been so great as those of the previous year, nor was as much territory covered; yet the work has been harder and more exacting on the inspector and performed under greater difficulties than the work of 1908. The reasons for this were: 1st, the cool and excessively rainy weather of the spring and early summer, which greatly retarded inspection work. During this rainy season, the inspector got the benefit of several spring showers, and on one occasion came near being drowned in a swollen stream. 2nd, some of the best time for inspection work was lost while waiting for the appropriation to be made available for this work. 3rd, the extremely hot and dry weather made inspection work very difficult, for the blooming season of nectar-producing plants was cut short, and the season was as discouraging to bees, as the beekeeper. Many failed to secure stores sufficient for winter, and will die of starvation, unless fed by their keeper. This scarcity of stores induced robbing, and this robbing in diseased districts was the means of spreading disease and enlarging the area of diseased territory.

While these influences may reduce the number of colonies of bees in the State, and to some extent discourage the industry, yet there are some hopeful and encouraging signs, one of which is the promise of a favorable season, when the bee industry will build up with wonderful rapidity, and soon regain its loss. Another is, that with these winter losses will go quite a number of colonies that have contracted disease, and to some extent, this will help to prevent the further spread of the trouble.

Furthermore, these discouragements should be object lessons, not only to bee keepers, but to prospective bee keepers as well, for there are some who yet believe the old saying that "Bees work for nothing and board themselves," and who really think that all that is necessary to supply an ordinary family with honey is to procure a swarm of bees in some old box or hollow log and place it in some out-of-the-way place, and then visit it with the ancient smudge and torch light equipment as often as honey is wanted. But with the more successful apiarists more progressive ideas are entertained. They realize that intelligent thought and management are as essential to success in bee culture as in any other line of business, and that unless the prospective honey producer is willing to give a reasonable amount of care and attention to his bees, failures are most likely to be the harvest that will be reaped, and he will realize that his table would have been better provided with the tempting sweet, had he bought honey instead of bees.

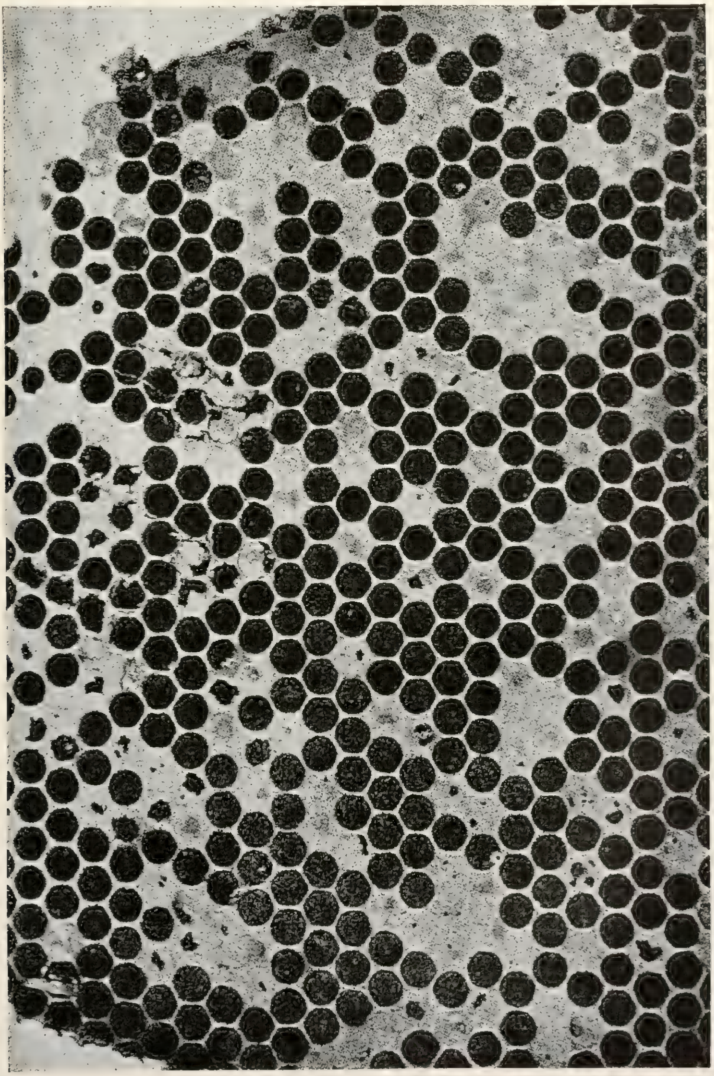
In emphasizing the importance of caring for bees, it may seem to some that I am putting too much stress upon this subject, but if the questioner could have gone with me through the work of inspecting for one season and made a careful study of the whole situation, I think he would readily agree with me in the statement that, ignorance, indifference and negligence are the greatest drawbacks to successful apiculture.

These are the greatest obstacles in the way of eradicating the disease, Foul Brood, which has gained such a wide spread throughout the United States and Canada.

I will here give a very brief description of Foul Brood, the most disastrous bee disease we have to contend with.

SYMPTOMS OF AMERICAN FOUL BROOD.

In the advanced stages of this disease the colony becomes weak and listless, and upon opening the hive a very disagreeable odor will be noticed, resembling somewhat the odor from an old glue pot. In lifting the combs from the brood nest, it will be found that a large per cent. of the unhatched young bees are dead in the cells. Those that have been sealed over will have the cappings sunken and perforated, causing the comb to have a ragged appearance. The dead larvae, if punctured with a tooth pick, will draw out a ropy thread like melted glue or rubber, This dead larvae finally dries up into a tightly adhering scale, which sticks to the lower cell wall so tenaciously that the bees are unable to remove it.



Foul Brood.

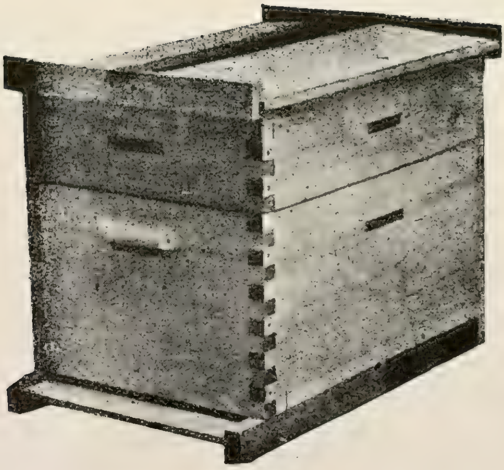
The European type of Foul Brood, in many respects resembles the American, but the tendency to ropiness is not so pronounced, and the dried down scale does not stick so tenaciously to the cell wall. A larger per cent. of the larvae will remain unsealed. The odor is quite different, being more like soured dead brood.

The most satisfactory method of treatment is the McEvoy plan of brushing the bees into clean hives and allowing them to build a new set of combs.

For more complete descriptions of bee disease and printed instructions for treatment, apply to the inspector.

I had expected to give at this time the results of some experiments in feeding, but I find it necessary to watch results a little longer.

Respectfully submitted,
M. E. DARBY,
Apiary Inspector.



REPORT OF DAIRY COMMISSIONER.

To the Honorable Board of Agriculture:

Since receiving the appointment of Dairy Commissioner at your hands, the work of that office has been handled in connection with that of Food Commissioner and the amount of dairy inspection which has been done in connection with the latter office.

As Dairy Commissioner during the summer, I attended several dairy picnics and discussed to the best of my ability, dairy conditions in the State and advocated insistently the use of the State Agricultural College and especially the dairy school by farmers as tending to give them a better knowledge of the dairy business and inducing more farmers, by virtue of the better knowledge, to go into the dairy business.

Without being able to give specific data. I am informed that a large number of creameries have been established this year in the State to take care of the milk from farmers who are adding milch cows to their herds.

In October it was the privilege of the Dairy Commissioner to make the trip down the Current river with Governor Hadley and party, and was enabled to present in public to the farmers who met at the several places where stops were made, the advantages of the Ozark country especially for the dairy business, pointing out the splendid native grasses, the mild climate, and the nearness to market, as evidence of the adaptability of this locality in Missouri to profitable dairying.

Since returning from that trip correspondence has been had which proves that a number of farmers have purchased additional cows and are shipping cream to St. Louis and Kansas City, as well as to local creameries.

In one instance it was the privilege of the Dairy Commissioner to assist a local cheese factory in trying to secure additional capital to carry on their business, and while this has not yet been completed he is hopeful that something can be done for this factory in this connection. Also the Dairy Commissioner is trying for these same people to show the farmers the desirability of selling their milk to the local factory.

Inasmuch as no appropriation has been made for the Dairy Commissioner Department, a Dairy Inspector must be one who is on the payroll of the Department of Food Inspection.

I have been endeavoring to secure the services of an expert dairyman, who can consistently do the work of inspector, as defined by the law, but owing to the small salary of $1,000.00 a year, I have only just recently been able to secure the services of, what seems to be, a competent man. From this time forward this man will give his undivided attention to inspecting creameries, and, in connection with the Dairy Commissioner, holding institutes at the several creameries in the State, as contemplated by law; also, it will be his duty to take up all the stations where butter fat is bought, to see that the producer is getting justice.

The office of Dairy Commissioner is so important, and his duties so wide under the dairy law, that it is to be hoped that the next Legislature will provide an appropriation sufficiently large to enable the Dairy Commissioner to employ not less than six expert dairymen, at salaries not less than $1,200.00 a year, and a sufficient expense account to enable them to be consistently active in the State, looking after the dairy interests.

In my opinion, based upon my experience, the Dairy Commissioner should have provided, by law, the services of a proficient chemist, who should be paid not less than $1,500 a year to secure the services of a competent man. In order to enforce the law, it is sometimes necessary to bring about a prosecution, and to do this successfully, a chemist, to be a witness, must be one of experience.

As the law at present stands, the chemist work of the department devolves upon the chemist of the Agricultural Experiment Station, when, as a matter of fact, this latter gentleman has more work than he can attend to.

It is my opinion that if the Dairy Commissioner is given the proper assistance, that in a few years the dairy business in the State of Missouri can be made second to none in the United States.

The farmers have only to be shown the profits in dairying, when they will take kindly to the business and increase the dairy values of the State.

Respectfully,
W. P. CUTLER,
Dairy Commissioner.

Farmers' Week in Agricultural College.

December 28, 29, 30, 31, 1909.

Seventh Annual Meeting Missouri Corn Growers' Association, Thirteenth Annual Meeting Missouri Improved Live Stock Breeders' Association, Twentieth Annual Meeting State Dairy Association, Third Annual Meeting Missouri Swine Growers' and Breeders' Association, and Third Annual Meeting Missouri Home Makers' Conference Association.

(Conducted under the auspices of the State Board of Agriculture.)

THE PROGRAM.

MISSOURI
FARMERS'
WEEK
HELD UNDER AUSPICES
STATE BOARD
AGRICULTURE
IN THE
AGRICULTURAL
COLLEGE
COLUMBIA
DEC. 28-31, 1909

The interest taken by the farmers in this convention was equal to that of our previous meetings. In addition to the associations which have been meeting here during Farmers' Week, there were organized this time the Missouri Draft Horse Breeders' Association and the Missouri Farm Management Association.

For the first time in the history of these conventions, the Agricultural College, upon the suggestion of the State Board of Agriculture, arranged a four days' short course in practically every department of the College; and this course was put on in lieu of the regular institute program heretofore held. During the evenings the program was arranged as much for entertainment as for instruction. Therefore, the report of the meeting is not so well adapted for filling up the Annual Report. It was quite impossible to secure a report of the consecutive lectures given during the day, and only those available for the evening meetings are herewith presented.

ADDRESS OF WELCOME ON BEHALF OF COLLEGE OF AGRICULTURE.

(F. B. Mumford, Dean.)

You have listened to words of welcome by Secretary Ellis of the Board of Agriculture; you have listened to words of welcome on behalf of the president of the University; and it is now my pleasure to welcome you to these meetings and to the Agricultural College on behalf of the Agricultural College. There never has been a time in the history of the world, in any country, when so much attention has been paid to any occupation as there is being paid at the present time to the occupation of farming in the United States. Our government spends more money perhaps than that of any other country in the civilized world for solving the problems connected with the vocation of agriculture.

Railroad presidents and various organizations have come to feel that the prosperity of agriculture and of farmers is of more importance to them in their business than is the prosperity of any other class of people. There is no philanthropy in this on the part of the railroads. It is an economic proposition. Then, there is scarcely a man in the United States that in the past few years has not come to feel that the man who produces the food supplies is more and more an important factor in the everyday life of every citizen. We hear on every hand the statement that the high cost of living is now perhaps one of the most important factors to be taken into account in the future development of our national life.

In the past fifty years the farmer has been little regarded. There has been a limitless extent of land and we as farmers have been engaged in a policy of ruinous competition with one another which has made it very easy for those who are buying the food supplies produced by the farmer to secure them. But for the first time in our history the demand for food supplies has caught up with the supply. In the very near future there will be no large exports from this country. The problem that is confronting the American nation today, as well as the farmer, is how to provide food enough for our own people; and this is a problem that is not of interest solely to you and me, interested as we are in agriculture and in its production, but it is a question of fundamental importance to every man, woman and child in America.

It is my purpose this morning to call attention to some of the possible solutions that have been suggested to meet this condition. This condition is the result largely of a very rapid increase in population combined with a decrease in the factors of production. In the past it has been possible for us to move forward and occupy new land of virgin fertility. We can occupy no more new land. If all the land it is possible to irrigate could be irrigated inside of five years, it would have very little effect upon the total food supply of this country. James J. Hill, whose words of wisdom are heeded in the United States, is quoted as much or more than any other man in regard to the great problems of agricultural production. Mr. Hill has recently, in many public addresses and in the public press, given expression to a number of opinions to which I wish to call your attention as possible solutions of this problem. It has been suggested, among other things, that what we need is more people in the country; that in order to reduce the cost of production of the staple products of food we should import from the city the unemployed and the agriculturally untrained. You will agree with me, I am sure, that this is not a high compliment to the intelligent men of large experience who find it rather difficult to make a good living on the modern farm with all their intelligence and experience. This is a very poor solution of the problem. It is impractical; and while there are a number of people in the city who might be better off in the country, it will not to any appreciable extent, solve the problem.

Now, you and I, with many others, have been guilty of urging everybody to stay on the farm. I have for a number of years had the pleasure and opportunity of teaching students in agriculture, and I think they will all tell you that I have constantly urged them to go back on the farm instead of following any kind of professional work in agriculture or any other kind of work. But the same people who are urging boys to stay on the farm, are also suggesting certain plans and methods of farm management which are not altogether consistent, and in this connection I have here a quotation from Mr. Hill which I wish to read to you: "There can be no greater aid towards the maintenance of a prosperous, free and enlightened nation than to keep the children on the farm." In another connection, Mr. Hill has also made this statement: "Such close and careful cultivation as will yield the highest profit per acre can best be given to land when it is cultivated in comparatively small farms. The greater the number of prosperous farmers the greater will be the prosperity of every business man."

Evidently, in the mind of Mr. Hill, the solution of the problem of the high cost of living is *the small farm.* All that the successful farmers who are here today need to do in order to be more successful, is to dispose of half of their lands and devote all of the labor heretofore applied to the larger area to half of the present area. That is the logical conclusion of the argument which holds that the future of our agriculture is to be a subdivision of the present farm units.

I wish to call your attention to certain economic fallacies in that idea. It is rather a strange fact that men who have become successful through modern methods of organization, of large enterprise, and subdivision of labor, should make an exception to agriculture, assuming that agriculture is a vocation which can best be carried on without organization and in small areas. It is just as logical for us to undertake to say that it is more profitable to make shoes as they were made by the old cobbler of fifty years ago, and that we should subdivide the modern shoe factory that turns out its 500 or 1,000 pairs of shoes a day, as it is to say that the large farms should be reduced to the smallest possible area. There are certain dangers in this idea. It is a very attractive idea, especially to the man who hasn't the means to buy a large farm. It is surely a very alluring proposition to the man on a salary to think that he could, with his small capital, buy a small farm of ten or twenty acres and become independent. A few years ago, a man wrote a book on the subject ''Ten Acres Enough,'' and he induced many city people who did not know much about agriculture to settle on ten acres of land, and one of these gentlemen who settled on ten acres wrote another book, the title of which was ''Three Acres Too Much.''

Now, were we following out the idea that is suggested what would we come to? This is what Mr. Hill says we will come to. He says: ''It is certain that in every state, farm lands will ultimately be divided and subdivided until every farmer has only as much as will allow him an ample reward for his labor and enable him to support his family in comfort.'' The idea from his point of view is to reduce every farmer to a *maintenance ration.* Now those of you who feed cattle know what that is. It is just so large a ration as will maintain an animal as he is without gaining or losing; and the ideal for the American farmer, in the minds of a great many people is to subdivide the land and put each farmer upon just so many acres as will provide for his bare necessities. Now that's not very consistent with the efforts which you and I are making to keep the boy on the farm, is it? If I thought that that was the ultimate solution of the problem of agriculture, I should never again say to my classes ''Go back to the farm,'' and you gentlemen know very well that that is not the solution of the problem, and it is not possible for us to induce men of ability, men that are capable of leadership, to go on the land if it means a maintenance ration.

Now it may be argued by some, that there are two sides to this question: That it may be very desirable from the farmer's point of view to occupy large areas of land,—it may mean prosperity to the individual, but that it may be a decided disadvantage to the state. For the commonwealth it is better that the farmer should be reduced to the small area of land. It cannot be demonstrated that the cost of production will be decreased by advocating smaller farms. Do you think—and I am talking to the most successful farmers in the State of Missouri who are fully capable of solving this problem—that if your farms were divided up, and each 400 acre farm divided into ten farms, and on each of those forty acres a less efficient man was placed as manager, that he could produce more from that forty acres than can you?

There must be organizing efficiency in order to accumulate wealth, and it certainly is true that the man who by study and thought and business sense has been able to build up and improve a large farm is better able to secure from that land the maximum product than is the less highly and efficiently trained man of less experience.

Let us examine in detail this fact which is brought out very clearly by Mr. Hill—that reducing the size of the farm and devoting more labor and care to the production of the crop will decrease the cost of production. Now modern agriculture, so far as it pertains to the staple crops, cannot be successfully conducted under modern conditions without the use of labor-saving tools. It cannot be conducted for two reasons, at least: One is, that we cannot now secure the necessary hand labor, and the other is that it is cheaper, even if we could get the labor, to bind wheat with a self-binder or corn with the corn binder than by hand. The small farmer cannot afford to own those tools. It is very easy to demonstrate the fact that the man who cuts twenty acres of wheat in a year cannot possibly afford to own a self-binder. The interest on the original investment, the depreciation in the machine, and the other fixed charges that will be the same whether he cuts twenty or eighty acres makes it impossible for the small farmer to own so expensive a machine for so small a use. The only possible way that we can use labor-saving machinery, and thus meet the present scarcity of farm labor, is by having a sufficient volume of business so that we can afford to own these machines. I cannot go any further into detail, but it is a very easy matter to demonstrate the fact that a man who cuts twenty acres of corn a year and owns his own corn binder will pay $2.50 an acre for the privilege of owning the corn binder, while the man that cuts eighty acres with the same machine can do it for $1.50 per acre. Under these conditions, the small farmer cannot produce corn cheaper than the large farmer. The best example of the small farm is found in New England. The most intensive farms and the smallest farms are in

New England, and they are economic failures. The plan is a failure as applied to New England conditions, and yet these farms are located in the midst of the best markets and are in a good country. Intensive farming, which means the application of more labor, more fertilizer, more care, to the unit of production (the bushel of corn, the pound of beef or of butter), can only be applied when the value of the product is sufficiently large to make it economically possible. Whether that time has now come is an economic question which we will soon work out, but it does not follow that, under all conditions, intensive farming will make prosperous farmers and profitable farming. Neither does it follow that a small farm intensively cultivated will decrease the cost of production.

Now, I am afraid that some of the things I have said may lead some of you to think that I am advocating careless farming. Some people have made the mistake of assuming that large farms and careless farming are necessarily the same thing. We must certainly improve our methods of production, we must certainly in the American nation, increase the amount of production per acre; but in order to do that, it is not necessary to reduce the size of our farms. Within certain limits, it is not necessary for us to have a different standard of economic organization for agriculture than we have for making shoes.

Another criticism that may be offered is that land is so high now that a man must be satisfied with a small farm. My answer to that is, that there never was a time when it was so easy to secure large farms as it is now. We have in the past assumed that ownership of land was necessary for prosperous agriculture. We are now at the point where successful agriculture will be conducted on rented farms, and I speak from experience when I say, that it is cheaper to rent land than it is to own it in Missouri, and in most portions of the Middle West. It is cheaper to rent land than to own it; and most of you gentlemen, I am sure, will bear me out in that statement when you stop to estimate the cost of maintaining the improvements on a farm, the decline in soil fertility which is a debt upon the owner, and the other factors involved. I am not pleading for careless farming, but I am definitely and positively opposed to the idea of reducing every farmer to a ''maintenance ration.''

We shall always have a large number of small farms. The ''one-man'' farm is an economic unit. It is not the best economic unit,—it can never be; but we will always have ''one-man'' farms, that is to say an amount of land which can be handled by one man and his family. But that man will always be at a great economic disadvantage.

He will sell in small lots and buy in small lots, and he will suffer more than anybody else from the middleman.

Now, another trouble which is a serious one and which affects the farming class as well as the consumer is the wide distance between the man who produces the food and he who finally consumes it. There certainly is too large a stretch between the man who produces the food and the consumer. There is only one possibility for the small farmer, and that is in correcting this distance by co-operation. We must get together. It will be forced upon us in self-defense in the near future, and unless we can co-operate we are almost certain to be at the mercy of a large number of dealers, and particularly does this apply to the small farm.

Now, my purpose in calling this to your attention was not to discourage the small farmer, nor certainly the man who wants to own a little land, but my purpose is to emphasize the fact that the opportunity for large success in agriculture is in co-operation and organization, and that the man who will devote the same care and attention and apply to agriculture the same economic principles that have been successful in railroad building, and that have been successful in making shoes, will also be successful in agriculture, and this ought, it seems to me, to be an encouragement particularly to young men who are wanting to engage in agriculture at the present time but who hesitate to do so because of the high price of land, and because of the constant insistence which many persons place on the fact that all future farmers must be small farmers. The American farmer has never been an ignorant peasant and it is not essential either to society or to successful agriculture that he should become so.

AGRICULTURE IN THE SCHOOLS.

(Dr. A. A. Brigham, Brookings, South Dakota.)

The two most important products of Missouri and of the United States are Chickens and Children. Both classes of creatures, judging from the past three days in Columbia, are coming into their own in Missouri. I will not say much this evening about chickens, but I do wish to make a plea for the children.

When I came into this hall and saw on the wall the great word "FARMERS," and beneath it the word "MISSOURI," I wondered a little at first. It seemed as though it was not complete, as though there ought to be an admonition added, such as, "BE PROGRESSIVE," or the Latin motto "Non factus sed faciens," which means

"Not having done but doing," or some indication that there was something to be done. Now after two days spent with you I realize that the word "Missouri" spells progress.

In the olden time when some of us were boys and went to school, we were taken in our school room far away from the home, far away from the farm. Our studies took us to Africa, India, and South America, and we were taught the wonders of these countries and of every place except the farm and our own home. Sometimes the teacher would get discouraged and tell us, "you don't know beans." Well, we didn't know beans because we had not studied them in those days. Today we do study beans and we study corn and potatoes and cabbages. We do not hold the head down in shame because we do this. We are proud to study about corn and beans.

In the olden time the college education was not for every boy. The way our grandfathers decided this question was to select from the family (of perhaps a dozen children) the brightest boy, or the boy who had the best intellect, and send him to Yale or Harvard to make of him a lawyer, a doctor or a minister. All the rest of the children stayed at home and worked hard with father and mother in order to furnish the money to keep that bright young man in college that he might become a member of one of the professions. Today, ladies and gentlemen, the tables are turned, and we are selecting the brightest boy in the farmer's family to send to the state agricultural college to *make of him a farmer*. More than that, the girls in the olden time did not have the college privileges; today we are picking out the girls and sending them to the state college to prepare to become homemakers. This is one of the steps of progress of our age. If we find in the family a boy who is a little light in the upper story, or who is somewhat cunning, we send him to college to study law or medicine. If he cannot make a lawyer or a doctor we turn him into a "politician." That is one reason why we get the kind of laws that we do today in our legislatures. I hope this thing will be changed. I don't know what we will do with those poor boys then; but I hope we will bear in mind that it is necessary to have good laws; in order to have good laws it is necessary to have good legislators who are not "politicians" but statesmen. Shakespeare defines a politician as "One who would outwit God." I think he has well defined the animal. It is time that we send *men* to our legislatures, that we tell those men what we want before we send them there, and then that we go down and see that they do it. I have heard that you need money for this institution. I think you can get it if you will educate these farm boys in the right way and send them home to be farmers, and educate them so that they will not only understand farming but also understand statesmanship.

The work of education in the schools—the common school, the high school, the college and the university,—has changed greatly and agriculture is beginning to be taught. If we can teach agriculture as we have been teaching it, teach it better than we have been teaching it, and go on with book knowledge, with lectures, with class room work and laboratory work, and keep it up for another fifty years, we will place our profession of farming higher than the profession of the law, of medicine or of theology. These have had the advantage of centuries of education, of universities and colleges and text books. But we are coming into our own and will raise our profession of farming higher than any of them. I call it the profession of farming because I believe it is truly a profession, and I believe that each practical farmer ought to be called a professor. He is a professor. Just as soon as he takes up the work of the farm he professes farming, does he not? I realize that the title "*professor*" is not a very high one in some instances. We have professional boot-blacks, hair cutters and horse trainers, and so in this country the title *professor* does not rank as high as it does in the old world. But if we take up this idea that farming is a true profession, and that every man who takes it up is a professor, perhaps we shall bring honor to the name and the farmers may be pleased to have us who are now called "professors" included in their class. We hope they will not exclude us.

In the great work of introducing agriculture into the schools, as a subject to be taught to the children, we are almost at a standstill. Why? Because the teachers in the schools are not prepared to teach agriculture. The papers advocate it, the people welcome it, the pupils are ready for it,—everybody is prepared for it except the teachers. Many of the teachers are willing, but they say "I don't know how to go at it." How many times I have heard a teacher say, "I would gladly take up the subject of agriculture and teach it to my boys and girls if I only knew how!" Well, how is a teacher to take hold of it, when in her school district there are perhaps farmers who would laugh at her, if she would undertake to tell the boys how to farm, or the girls how to work in the farm home. Therefore my sympathy goes out to the teacher who is not prepared. It is not the teacher's fault that he is not prepared, when the normal schools, which turn out teachers, do not prepare them to teach agriculture. It will not do to blame this and that one, because we are all at sea, and do not know yet how we will develop this subject of agriculture so as to include it in our school curriculum. But gradually light is coming; by experience we are learning to teach agriculture. I believe that the two most important things to consider today in regard to these teachers who ought to be teaching agriculture, are (1) personality, and (2) teaching for efficiency, for usefulness, for healthfulness. With these two ideas in view I believe that any teacher can make a beginning. The beautiful thing about teaching agriculture in the public schools is: that when a teacher takes up the subject he need not know it all. I know of no one who is teaching agriculture who pretends to know the whole subject. Each one thinks he has learned a little and is willing to tell of that little to his pupils; but every one who professes to teach agriculture has only begun himself to be a student of the subject. So when we begin the teaching of agriculture is it any wonder that we hesitate and do not know how to carry on the work? Now if the teacher has the *personality* that a teacher should have, and desires to teach these young people the facts that are necessary for them to learn if they are going to become farmers, if that teacher has the ability to teach them so that they can study subjects, so that they can understand subjects, so that they learn to investigate, then he can make a beginning. That beginning may be a very simple affair. Perhaps with something like nature study, the study of the birds, of the trees, of the crops and the soils, or of farm animals, or almost anything. Everybody knows a little about some subject on the farm, and why not begin with that? Then the teacher can say candidly to his pupils, "I don't know a great deal about this subject, but I will tell you what we will do—we will study together." He will probably get an opera glass and take them out in the field. They examine the birds through the glass, or they study the trees along the road side. Some teachers will tell you that they haven't time for the teaching of agriculture, or nature-study, and certainly no time for home-economics. The teacher who has the right personality will find the time, and the beautiful thing about it is that the taking up of one of those subjects soon so interests the students that they become enthusiastic over it, and are ready to exert themselves more in their other work. When the boys find their arithmetic terribly hard and their grammar difficult to understand, if the teacher will get their minds off of those studies for a while by giving them a little work in nature-study, they will become interested and the first thing the teacher knows they will be doing better in arithmetic and grammar and everything else. I think that taking up nature-study or agriculture is something like calisthenics. Sometimes you go into a school room and find the doors and the windows all closed, and the air heavy, and the teacher has a headache, some of the pupils are almost asleep, and everybody listless and slow. The teacher says to some of the boys, "Open the windows," and they open them and let in the fresh air. Then the teacher says, "Stand up." They all rise. He tells them to go through the motions with him, and they do this for several minutes. Then they sit down and find that somehow the trouble they had with their arithmetic has all cleared away. Up goes a hand, "Teacher, I have the answer." That's nature study for you—fresh air. They had been breathing carbon dioxide gas, and you cannot solve arithmetic problems on that kind of atmosphere; you can not work out the lessons in geography and grammar unless you have oxygen in the blood; and the teacher can not teach properly unless he breathes fresh air. Short lessons in agriculture and home economics can be given in the same way.

Take ten or fifteen minutes and devote to the study of corn, or of the potato, or any subject relating to the farm, and the pupils will realize that when they go to school they do not go to a foreign country to study about bananas or cocoanuts. They learn that there is something worth studying on the farm. Corn is a very interesting thing to tell them about. This great work of boys' corn growing contests, going on here, is one of the most valuable things that could be introduced in the line of education, in the uplift of agriculture, in the uplift of the boy's heart and soul and mind and body, in the uplift of the rural community, in the uplift of manhood and womanhood throughout the United States. Let the good work go on, and let us have more work of the kind, and let it extend to contests by the girls in bread-making, etc. When we introduce these things into the public school not only do the pupils learn something, but the teacher learns also; I think that one of the nicest things about this work is that the teacher is making progress. I have gone into a little white school house in South Dakota and have seen the teacher (who had fourteen pupils and twenty-seven classes) trying to interest the children in arithmetic and in grammar. She did not seem to get along very fast; but if she had taken up some of the things on the farm that the boys know about, and even showed her ignorance and let them tell her something, they would have been interested and would have done better in their regular studies.

One way for the teacher to do something along the line of agriculture is to have in the school house an incubator and a bee-hive. If one cannot get an incubator, get an old sitting hen and place her in the cellar and get some nice eggs and place under her. The bee-hive is good for several reasons, first along the line of nature study, and second if there is any boy who is particularly troublesome, a good remedy is to let a bee get after him. If you will place the incubator in that school room, and will set white thin-shelled eggs, and after they have been in the incubator for one or two days, darken the room and take out some of them, obtain an egg-tester, hold the eggs up to the light and let those boys and girls look at them, they will realize that here is something they did not know before, something they did not understand before. If you will break open one or two of the incubating eggs and show them what is going on on the inside they will learn a lesson that they never learned before, a lesson that they cannot get out of text books. I have looked through a great many books and encyclopedias, and have hunted far and wide for a definition of "Life." I have never found a scientist or a philosopher, or any other wise man who was able to give me a definition of the word "Life." It is something I cannot explain to you—I do not believe you can explain it to me, and yet it is the most wonderful thing in the world. Take that egg and let it develop by incubation and show it before the egg-tester to those children. Open the egg in a glass and show the little pulsating life beginning there, show it at the different stages, and then take those eggs on the eleventh day, and prove to those children that in eleven days a chick has been perfectly formed. They will begin to realize something of what life is. I know of no better way. Huxley said that the development of the embyro in the egg was the most wonderful thing in the world. You might say it is a miracle—the perfect forming of all the parts, in the eleven days,—the miracle of life. Do you think that any pupil in any kind of a school will fail to be interested in that little life story? And when he has become interested in that story he will become interested in the chickens. The next thing he will be asking his father for the care of the chickens, and soon he will have charge of the flock. He will become interested in them because they are beautiful birds and have beautiful feathers. After a while he will be getting a little pocket money because poultry, in the hands of an interested farmer boy who is willing to work, is profitable. Next that boy will have pure-bred chickens on the farm and be making good money from them. May be later he will have a large poultry farm and give all his time to the business. When the father gives that boy his flock of chickens he tells him he must keep accounts, and if he does not know how he will get some one to show him. That boy will keep account of all money spent and what he received by the sale of eggs and chickens, and at the end of the year he will be able to tell how much he has gained. Thus he has become a business man. If he leaves the farm and goes to the city, engages in commercial business, or takes up any other calling, he will have had that foundation training in the keeping of accounts which will go with him and make him a more systematic man all through his life.

The bee-hive is all right, too. A nice way to arrange it is to get an observation hive with glass sides, and keep a cover over it. If you try to keep it in the light the bees will put a coating on the glass and then you cannot see them working. Perhaps it would be well to leave the glass sides of the hive uncovered and allow the bees to cover the glass with wax, to show the pupils that they do not care to have their operations looked into all the time and so put up a curtain around their home. If you can keep boys and girls away from such a beehive you can do better than I. Get hold of those careless boys, talk to them about the queen bee and the drones that they see before them. They will soon become interested and will begin to ask questions. They will want to know what that big bee is and the teacher will tell them it is a drone; they will want to know what a drone is and will learn something that will be valuable to them—not to be drones in life. They will ask about the queen bee and the workers. A lesson will be learned by looking; and the lessons that we learn by looking and watching and hearing we learn thoroughly. I advocate the placing of a beehive in a school room for another reason: because the bees have learned to live and act better than some human beings. They are the nicest, cleanest housekeepers on earth. They manage to work together in the same colony without quarreling, while we often have envious and troublesome times. Those bees may teach the boys and girls another lesson, and that is this: When a bee stings any one it does it in defense of its home, that it loses its life when it does so; and when a boy learns that he learns something that is worth while.

In all this work of teaching agriculture, the teacher's inventive ability and personality will count for a great deal in the future lives and work of the pupils. I believe that this is an argument for selecting teachers who have the right personality. I know that in some states (but not in Missouri, I hope) teachers are selected because they are relatives of county school officers; that sometimes they are selected because they have a political pull; sometimes because they desire to draw a salary and don't care much what they do for it.

This matter of personality is emphasized time and time again. I have heard of many cases where parents have remarked, "We had a teacher last year who taught well and got the boys interested; we wanted to keep her this year but we couldn't. She is going to college." I have heard of many cases where the teacher's personality was the cause of her gaining an increase in salary. And so in many ways this matter of personality is emphasized, and I believe that school officers, county officers, and others who have charge of our schools, will have to come to the point where they will pay more attention to the character and ability, and particularly to those qualities which make up good personality in a teacher.

I would like to take you with me for a little trip to show you how the Oriental people are taught agriculture. If you will go with me back a few years, and across the turbulent waves of the Pacific Ocean over to Japan, I will take you to a field where I had forty Japanese students in farming. They were taught in the lecture room and then in the field. I would take them out to the field plots twice a week, and they thought they were carrying on experiments which were on a par with some of the best German experiments. After they had been taught the plan of cultivation they would go and study up some of the wonderful German experiments and would get the idea that there was something to be investigated, or they would want to try some new kind of vegetables. They would make their plans and submit them to me, and I would correct them or change them if I thought necessary, and the finished plan would be adopted by each student. Each would choose his part of the field, or have it chosen for him. I purchased from America a set of garden tools for each student. We would go out into the field with those tools and while they did not really learn much that was experimental they did learn how to use the hoe and rake and spade. They were sons of officials who looked down on manual labor, and they had no idea of going into farming—they were going to become officers or teachers. Nevertheless, some of them did become farmers, and some of them are today living on farms with their families. They have sent me photographs of some of their gardens showing that they have taken up the business of agriculture and are doing well. So I have the proof in my own experience that you can teach the yellow-skinned race agriculture by getting out into the field with them and "showing them." They can learn it by working with their hands and thinking with their heads. Some of these students became so interested that they would go out and work on Sunday; and when I rebuked them they could not understand why I should do so when it was all so interesting and valuable to them and would be so valuable to the world. Dr. Knapp told you last evening about some of his experiences in the South, and how in some degree the difficulty with the negro has been solved by manual training and industrial schools; how the Hampton and Tuskegee institutes have solved the problems of saving the negroes from idleness and crime and made useful citizens out of them. I want to add my testimony to what he said. Three years ago I purchased a farm in Maryland and secured a colored man for a helper. I want to tell you that he is honest, straightforward, faithful, and true. I have left the farm in his charge for months at a time and have never found him unfaithful. Why? Because back in the olden time, fifty years ago, when he was a boy he was trained in a southern home by a man and a woman who understood how to train children, and they trained that colored boy so that he knew how to work, how to use his hands. They trained him to be honest and faithful to his employers, and made of him an honest, useful citizen. I have seen negroes in the same neighborhood who are not honest and my poultry yards have suffered thereby. I have seen them going up and down doing nothing, when the farmers needed help and would have paid good wages could they have obtained their help. Those negroes had not been trained; they had been left to grow up in idleness, living like animals, learning to steal when necessary to get food. They were perfect nuisances and likely to become criminals. The reason why those colored men are criminals today, or useless individuals, is that the white man has neglected his burden. They are children and need training and don't know how to train themselves. The white man does know how to train them. Almost the only salvation for those colored people, I believe, is in industrial schools. I would not have such schools at Hampton and Tuskogee alone. I would have one in every section of the South, and I would put manual training in every colored school in the South. When these colored boys and girls are trained to use their hands they will work. They are easily trained, are faithful workers, and good servants. The white man is now suffering evil consequences, in many instances, because he neglected his duty to the colored man.

I will give you one more illustration of the teaching of agriculture and why it is necessary in the public schools. I was told that you wanted me to tell the story of my School of Agriculture, but that is a broad subject. South Dakota is a new state and the public schools are not as good as yours in Missouri. Oftentimes in the country districts we cannot get teachers to fill positions, and in many localities we can only keep the school open four or five months in the year. Under those conditions the farmer boy does not have a fair chance to get an education; and so it was planned that we should have a School of Agriculture at the State College to instruct some of these boys and girls. It is hard for some of the boys to get away from home to go to school, because the farms there are larger than here—some 800 acres, some 1,600, some 4,000. Many a farmer has four sections, of 160 acres each, and cannot get sufficient help to run the farm. He has to call on the boys and girls to do the farming. They all take hold and help to get the planting done in the spring time so they have little time to go to school; and when harvest time comes they have to be called on again. I had a letter from a boy in November. I had asked him if he was coming back to school, and he wrote that they had 125 acres of corn to take care of, and he would have to stay at home and help husk it. I say those boys ought not to be excluded from the public schools just because they have to be at home, helping their fathers and mothers, during the busy seasons of the year. They do go to the public school at the end of November, and try to enter, but the rural school is modeled after the city school and not planned for the country boys; and when that sturdy country boy, who has been growing while helping with the seeding and harvesting on the farm, attempts to sit down in those seats he finds he doesn't know what to do with his feet and his hands, and he cannot study well. He goes back home and says he doesn't want to go to school because they laugh at him. He wants to learn, he does not want to be ignorant, but he will not go to school to be laughed at. I need not tell the whole story, but it is true—this and a great deal more. And so it was for these boys, and girls, that we established our School of Agriculture, and the first year we had over 100 students enrolled. Some say that ''book knowledge'' is not of much account; we had in our district a father who sent his motherless daughter to our school to learn cooking and sewing, and he stayed at home and ''batched'' for five months; and if that does not mean that education is worth something, or that that father thinks it is worth something, then I don't understand human nature. That girl would like to have taken the whole course, but she had to go home and take the place of a mother and care for the home. In those five months, however, she got a great deal of good out of the course, and had learned how to be more useful and happy than before she went to school.

When I was a student in college and the professor was five minutes late we would all give the call to ''bolt,'' and when we would meet the professor coming up the stairs we would not see him. Last winter when our professor in stock judging failed to get to his class the boys waited ten minutes; then they went out of the room, but not to escape a class. They all came into my office and I could not turn them away; I had to find some way to interest them during that class hour, and I had to go after that professor and tell him he must not be absent next time. They were so eager for instruction that I had to take them into the lecture hall and talk to them on some agricultural subject during the hour. They come to school for business, to study, and they do study. It is one of the most wonderful things in the world to watch the changes that come in a boy's face after studying in the School of Agriculture. When the students go home to the old farm at Christmas time they will look over the live stock and sometimes decide that it is not good enough. I remember that one boy, who was interested in horses and had been studying horse judging, went home and said: ''Father, you have a lot of old plugs here. Let's get rid of them.'' I believe that this feeling is going to be of value, that it is going to help to have better horses, and better cows, and better corn. The boys get ideas about alfalfa, never thought of before, and before long that home farm is trying an experiment in alfalfa growing. There is no limit to the good that will be accomplished in this way; I believe in giving every farmer's boy and every farmer's girl throughout this State and every state in the Union, a good education, the best education, an education for effective life work. When we have provided that, we have provided something that will be of benefit to those boys and girls all through their lives, and, better than that, they will be of benefit to their friends and neighbors, and all with whom they come in contact. I believe in the farmer's boy and the farmer's girl. They are not always so pert and "smart alecky" as some city boys. I believe in any boy, but I pity the city boy who has only the pavement and the tall buildings to look at. Compare his life with that of the farmer boy who has the fields, the sky, the farm animals and the wild animals, the forests and the streams, and always on the farm a chance to work. Some people think that is a hardship, but it is the best thing for a boy—to have something to do and most of the time to be doing something. It helps prepare him for life. Is it not fair play to give that farmer boy as good an education as that city boy? I heard a story of a city boy who one day hired a livery team and took his best girl out for a drive. They drove along by a corn field in which there was a country boy—a boy with freckles on his face, full of life—driving the mules along plowing corn, and he came to the fence about the time Smart Aleck came driving along. Smart Aleck thought he would have a little fun with the Rube, so he called out, "Say, your corn looks a little yellow, don't it?" and the country boy answered, "Yas, we planted yellow corn." Smart Aleck said again, "You won't have more than half a crop, will you?" "No, we have half and the owner has half." Then Smart Aleck was mad and called out, "Say, there isn't much difference between you and a fool, is there?" And the country boy answered, "No, only the fence." The country boy is not a fool, and sometimes the city boy finds it out. If we farmers do our duty the time is coming when these farm boys and girls will get a good education. It means that in the country districts we shall have to spend more money in salaries to good teachers. I hope we may be able to educate the farmers up to the idea that it *pays* to educate these boys. I believe that we are justified in calling for Federal aid, for State aid, for county aid for our public schools, and then we can make up the rest of what is necessary in local taxes. There are reasons for this other than agricultural. Most of the successful business men of the cities were born on the farm. If the country is to continue to furnish the successful men of the city, ought not the country boys to be educated as well as the city boys?

Again, if those boys are going to stay on the farm and carry on the business of the country ought they not to be educated? Agriculture in the future is going to mean more than it has meant in the past. Ought there not to be a new education for the new agriculture? It is coming.

Those boys on the farm have problems before them which are both large and numerous. The boys who go to the city have municipal problems to solve, and I believe the great city problems are going to be solved honestly and justly by the farmer boys who go to the city. They will have to be solved, or the government goes down.

Another thing: We want the business of the country rightly carried on. We want better farmers, better crops, a better agriculture, better men and better women in our country districts. If it be true that there are problems on the farm to be solved, is it not necessary that the country boys should be educated and trained, that their powers and qualifications should be developed so that they will be able to cope with the problems? We are coming into the new idea of farming and leaving the old. The idea was to take up virgin land and rob it. That's the way they are doing in the Dakotas today, and in Montana. Men from the east and from the west are taking up the land and robbing it. The new idea is to keep up the land fertility while gathering the crops and making the crops grow better and better. That is one of the problems. I believe that in all our State colleges we should take up and try to give instruction along the lines of farm management, and the selling of the farm stock. I hope that our students in the agricultural colleges will soon learn the value of organization. There is wonderful power in co-operation. The boy must learn that lesson in order to sell the steers and the horses and the apples and the wheat and the corn to the best advantage.

There are other problems besides the actual farm problems—problems of the rural communities. When the farmer's boy finds life on the farm rather uninteresting, is it any wonder that he likes to go into town and to the saloon where things are bright and where the men are joking and seem to be happy; and is it any wonder that he takes the next step and the next, until he has learned things that he ought not to know? There is this problem, then, in the rural community—how to keep the children interested on the farm, how to hold them in the rural community and make life happy for them. It can be done. In Iowa the Y. M. C. A. is taking up work for country boys and girls, and forming clubs in different sections of that state. They hold classes in different subjects, and the youths can take up any line of work they choose. Thus they are training their minds, and their bodies, their souls, and making them useful in solving the social problems in their respective communities.

Then, there are other questions in connection with the rural home. One is the supplying of light and power. It has been said for several years that Edison was developing a new storage battery for electricity, but he has not brought it out. I believe that a farmer boy will yet develop a storage battery that can be used on the farm, because the farmer boy knows about the farm, and he is going to be educated along the line of electrical engineering and turn his attention to the needs of the farm. He will learn how to get power on it and take away the drudgery. Before many more years are gone by, I believe that the farmer boy will be able to harness the wind and furnish the power for the farm without much expense. The time is coming when less and less of hard manual labor will be required to accomplish the work of the farm, and it will be through the use of the brains of the farmer boys whom we are educating in our agricultural schools and colleges. There are many problems on the farm that I have not time to mention, but I would like to say this: Educate these boys and girls as well as they can be educated; prepare them for the greatest possible usefulness and helpfulness to their fellow men, that is the highest ideal of a true education. When we have done this we have made them of more consequence in the world, we have made their lives happier, we have made them capable of far more helpfulness to everyone with whom they have relations, we have made the home, the farm, the State and the United States better, and on this basis of good citizenship we will develop the greatest nation here that has ever been upon the face of the earth. I believe that in this work of making a stable government, of making happy homes, of making good farms, the new agricultural education is to play the greatest part. I believe that our State Agricultural Colleges will play a part, and that it is second to none in elevating the farmers and the farmers' boys and girls, in making the home happier, the State stronger, in giving to every farm home the good things of the city as well as of the country, and in making the farm life ideal. I can look back twelve or twenty years to the time when it seemed as though everybody was going away from the farm to the city. Now they are going from the city to the farm. We have the best calling on earth. When we make attractive plans for our farm life with a will to make good if we can, and when, instead of robbing our soil we conserve its fertility, and hand down to our children our farms in better condition than when we took them, then we have helped lay a foundation for good agriculture that is better than any foundation it has had in the past.

HOW AGRICULTURE MAY BE TAUGHT IN THE PUBLIC SCHOOLS.

(F. W. Howe, Assistant in Agricultural Education, U. S. Department of Agriculture.)

Long before the County Life Commission began its still unfinished work, popular interest in school agriculture as a means of improving rural conditions and outlook was already pronounced and wide-spread. That interest has continued to grow in strength and volume until there is now little need of putting forth any arguments in favor of teaching elementary agriculture in the common schools. If there is any question it is the question of securing teachers who have been trained to give such instruction, or of enabling those already in service to become prepared for such teaching.

The teachers themselves are ready to be taught, and generally willing to undertake the work under competent direction. Now and then perhaps a teacher may be found who has not discovered that soon it's going to be the fashion to teach agriculture—just as it used to be the fashion a few years ago to sneer at such a suggestion. Who does not know, however, that it is a feminine prerogative to poke fun at a new fashion in shoes or skirts or hats, and then forthwith begin to wear these detested fashions just as soon as someone else sets the example, and so agriculture has been spoken of as the latest school "fad." But to any lingering doubters I want to suggest that the teaching of agriculture has in it elements of worth and permanency not to be compared with this year's fashions in hats.

There are abundant reasons why agriculture will find, when it fully comes into its own, a permanent place in our American educational system—reasons too well understood to need any rehearsal to this audience. I am looking for the school—sure to be put in operation within the next five years, I believe—wherein this central place for agriculture shall be recognized, as the subject which can unify and give meaning to all the other subjects which are now pursued in an utterly unrelated way in most of our schools. Let me pause to ask, What study or principle is there in the ordinary school which leads the pupil to see that there is any unity of purpose in the pursuit of from four to a dozen different subject every day? It is true. that in many cases he can be induced to swallow the statement that this is necessary in order that he may become educated; but he admits it only on the authority of the elders and not because it appeals to his own reason He walks by faith and not by sight. If docile enough he takes the dose and hopes for the best—like the obedient child who is told. "Shut your eyes and open your mouth,'' while we lay on his tongue a sugar-coated spoonful of the sure-cure for ignorance. He may writhe under the administration, but we cheerfully continue it, just as Squeers doped his hopefuls with treacle and sulphur, and then tapped them on the head with the wooden spoon when they showed symptoms of vertigo. But you remember there were some goods things even in Squeers' methods. He always gave his boys a practical application of everything he taught. When a boy had learned to spell ''window,'' he was immediately set to wash the windows of the school building—and thus had the lesson ''rubbed in,'' as it were. We get the boy to spell, if we can, and then we hire a janitor to wash the windows. And so there were some redeeming features in Squeers' system, even in comparison with our own.

The great fault of our public school work, speaking broadly, is its failure properly to relate the student to his present and future work and surroundings. The boy or girl who is really destined, if he finds himself, to a life of business or industrial activity, is too often coerced by the school—if he does not rebel—into a line of study for which he has no natural aptitude or interest. The school machine fails to discover him to himself, because its course of study offers little or no opportunity for his own natural reactions. And all because of the old and false doctrine of the ''disciplinary value'' of the traditional curriculum.

Ex-Governor Hoard of Wisconsin has recently characterized this educational superstition most aptly. He says:

''Teachers have a great responsibility placed before them, for theirs is the task, not only of building up the human mind, but also of saving it from the appalling fate of a life of misdirected effort. We do not believe in much of the criticism that is showered upon teachers, for it is manifestly narrow, unphilosophical and unjust, and for these reasons, is worse in its unreasonableness than the teacher. But we do think that about all of this talk that teachers indulge in concerning the pursuit of any study for the sake of ''mental discipline'' is without merit. It is about as reasonable as would be the idea of loading down a horse and cart with a useless burden for the sake of the animal and vehicle. Teachers should be well versed in the physiology of the mind they deal with. They ought to know that there is such a thing as the ''wear and tear'' of study, which is always increased greatly, in proportion as there is less appetite for the contemplation of school subjects. It costs the student, who is forced into certain studies for the sake of mental discipline, vastly more of mental effort, often amounting to the reaction of hate, than it does him to whom the study is a pleasure. The assimilation of food by the stomach and brain is almost parallel in its methods of action. In the former there is such a thing as the influence of the nerves of taste which are a powerful aid to digestion. No one advises the eating of a lot of distasteful food for the sake of increasing tne strength of the stomach. Why should this be insisted upon in the use of food for the brain?''

Surely there is no virtue in adding useless burdens to the useful work of teacher and pupil, especially when the unnecessary burden cripples the child for all future activity. I would not *add agriculture* to the volume of work already required in the schools, but I would use it wisely as a means of ''redirecting'' and revivifying all the useful work of the school.

You will guess, then, that I would not prescribe agriculture merely as an appetizer for inducing the mastication and digestion of the more important and necessary studies of the curriculum. Rather, I should regard that study which most immediately relates the pupil to his natural environment and introduces him to all the other live subjects in the school as itself the most important; and let it lead him to see that the others become important and necessary to the fuller understanding and use of his own environment as a means of constant self-education.

So I would never justify the use of agricultural teaching merely to kindle the curiosity of children, merely to add zest to their book study, or to reconcile them to the tasks of formal instruction—and so treating it only as an incidental accessory of school work—but I would consistently work toward that coming day when the facts of the child's environment, the intense personal interests of his own home life, the responses which he makes, or ought to make, to his environment, and the modifications which he can bring to pass in that environment—I say, teach towards the day when these considerations shall be recognized as the real thing in education, and when books and methods and curricula shall come to be regarded at their true value as incidental and subordinate considerations.

But the question will occur, Can the teachers now in service in the schools teach the agricultural environment of the school without acquiring special training which takes them out of the common school? Or must we, rather, wail until a new generation of teachers can be trained for this work?

Well, it is quite possible, that some of those who are rated as good teachers will not easily regain their places if they step cut of the ranks now—and they may not succeed in establishing a more pleasing engagement. But it is not necessary that teachers now in the schools shall take a technical course of work in absentia from the rural school in order to teach agriculture intelligently and effectively As Editor Poe of the *Progressive Agriculturist* puts it:

"The assumption that a woman cannot teach agriculture, cannot teach the scientific truths about soil chemistry and plant physiology, unless she has been a field hand, is almost as illogical as the old negro preacher's method of proving that every woman has seven devils in her. You don't need to be a centenarian and a soldier in order to teach history; it is not required that a teacher travel around the world before teaching geography; she need not have written a book before teaching grammar; she need not have robbed graves and dissected corpses before teaching physiology. Why argue then that she must have broken steers and stemmed tobacco before teaching the scientific truths about soil chemistry and plant physiology that have practical application in the business of farming? You don't have to know how to hitch a mule to a plow in order to teach why it doesn't pay to plow deep and cut the corn roots in two at laying-by time; you need not know how to run a guano distributor in order to teach the effects of potash, phosphoric acid and nitrogen in plant growth; you need not know how to cure cowpea hay, to teach how nitrogen gathered by the cowpeas will enrich the land; you need not know how to shuck corn, to teach which type of ear has been found the best for corn production; you need not even have milked cows in order to teach that the Babcock Test will show which dairy cows are paying and which are not; nor need you have butchered steers in order to teach that with a Jersey cow and a Polled Angus, the Jersey is better for the dairy and the Angus for beef."

Let's consider, then, some of the ways in which the self-instructed teacher may use agricultural material for the benefit of her school and of the whole community. In the first place, we must remember that the common schools are not to teach the technics of the farm operations—no more than they are to teach the technics of any other trade or occupation. The boy can learn at home on the farm how to cultivate corn or feed a calf better than any woman can teach him these things in the rural school. The teacher is not required to put herself in the position of assuming to tell the farmer how to run his own business; but she can teach the principles that explain the why of things that many a farmer does not know, and she can ask questions that may fire the interest and study of the whole community—questions for inflammation, if you please. The point is that agriculture is to be used "as a means of education, to explain the environment and to develop the student, and not as a means of giving technical skill."

And the great advantage of this mode of procedure is that the teacher herself becomes educated in practical affairs of community life along with her pupils. In most cases she is herself a product of the old, formal, disciplinary, unpractical theory of education; and the glory of the new agricultural education is that, like Mercy, "it blesseth him who gives and him who takes."

It is said that the first science ever studied and taught was the science of astronomy—a subject as remote as possible from everyday concerns, except in the minds of those few dreamy farmers who may still sow and reap in the particular phases of the moon assigned to such enterprises. But to "come down to earth," to suggest concrete illustrations of what the modern teacher may be, I would recommend that the earth itself should receive some attention—not the far-off "ball or globe on which we live," as pictured and defined in the old geographies, but the very earth over which your pupils walk to school. How many of them know by sight, and feel, and smell, and taste, and definite name, the four types of earth and their combinations which make up all the "dirt roads" and cultivated fields of their own school district? Have specimens of these soils collected, carefully examined, and named, if need be, by the most competent farmer in the neighborhood.

This is real geography. The local district may afford most excellent opportunities for studies in the process of soil formation, and the value of its various components for plant production. Before or after studying the soil, I would have each pupil map the farms which lie along the road by which he comes to school, or at least his own father's farm. I would have him estimate, as accurately as possible, the kinds and quantities of farm products in his neighborhood, and the number of acres devoted to each. Make a study of the crop rotations used in the district, why they are used, and how they might be improved. What are the average yields of each crop and the average value of an acre of each? Find out why the less profitable crops are grown and what others could be grown to better advantage in maintaining the fertility of the soil. Find out what it costs to grow an acre of each kind of crop. Get bulletins of information on how to select good seed corn and other grains. Study these with the practical purpose in view, and then take the class into the fields and actually select the seed. Encourage each boy and girl to choose the seed for planting on his home farm next season, and show them how to care for this seed and how to test it before planting. Some farmers haven't time to learn and do these things (?), just as some haven't time to test the worth of their cow's milk; but the children can.

While crops are growing, give some attention to plant diseases and the most troublesome insect enemies of crops. "A young woman took her class into an oat field badly infested with smut. She took an ordinary barrel hoop and dropped it down in the field. She then counted the number of oat heads in the hoop and found what percentage of them were smutted. This was repeated in several places in the field and an average taken. A calculation was then made of the proportion of the crop lost by smut. Next the teacher got a bulletin on how to treat smut and gave it to the farmer. The following season this farmer treated his seed oats, had no smut, and saved several hundred dollars.

"In a similar manner farmers can be taught how to select seed potatoes, how to spray fruit trees and the like. An infinite number of subjects can be taken up by the teachers, depending on the type of farming in the immediate locality of the schools and not dealing in a lot of glittering generalities about which the teachers know nothing. Then, too, the teachers can borrow some good farm papers from their patrons and select good articles for supplementary reading by the pupils.

"The teachers can take an acre of timber land and have the pupils determine the number of merchantable trees, ascertain the species of each and find out the value of the lumber. The children can count the number of rings on the trees that are down and find out how long it takes to grow trees of a given size. Then the teacher could find out what revenues this acre of timber land would bring if handled as a forest. The forest service would furnish on request literature on how to handle woodland and how to estimate the amount of lumber in a tree."

That's not only good teaching, but it's also good strategy and good politics.

When harvest time comes, have the children save and bring to school the best samples of grain and the best ears of corn, and then have a little school and neighborhood corn show, the best specimens to compete afterward in a township and a county contest.

Frequent excursions should be made to neighboring farms for the purpose of examining some special crop, implement, method of tillage, or breed of live stock. The best neighborhood methods of plowing, planting, cultivating and harvesting, should all be made tributary to the information of the class in agriculture.

The farmer who would hesitate to come into the school and talk about his superior cattle, swine, sheep or poultry, can be easily persuaded to talk about them to a visiting group of children on his own farm. And after that it's not so hard to get him to talk to the whole school or the neighborhood at a school meeting.

The educational value of such school work is hard to overestimate. It sets children and parents to thinking for themselves about the meaning of their own work. And it promotes ideal as well as practical relations between the school and the home, and the parents with their children. Superintendent Harbourt of Andover, Ohio, reports that when he found a farmer soaking his seed potatoes in a solution of formalin and asked him why, he got this reply: "Well, the boy says this will prevent scab, and I am trying to please the boy." He planted these treated potatoes and pleased himself with a fine crop that fulfilled the boy's prediction.

One farmer, as the result of agricultural teaching in the district school eliminated all the scrubs from his dairy herd and last year sold ten Holstein heifers of his own raising for $1,000. Even the girls in the school could judge a horse's age within one year of when he is "old enough to vote." Farmers come to the school to get boys to show them how to spray and prune their orchards. The agricultural class is the most popular one in the school, and you can't buy a second-hand agricultural book in Andover, because they are all preserved for reference in the home library. Three boys have requested to be allowed to take the course again because they like the subject better than any other taught. Ever hear of a boy wanting to take Caesar or Latin prose the second year?

Agriculture and its correlate, domestic science, appeals to the human interest of the boy and girl. It explains things, and so makes rural life worth living for child as well as parent. It furnishes a natural purpose and incentive for the study of other useful subjects in the schools. It revolutionizes the view-point of teacher, pupil, and the whole community, as to the practical, lasting value of good school work.

I believe I have said and indicated enough to satisfy you that agriculture vitalizes more school studies than any other subject ever proposed. It illumines and gives dignity and value to geography, geology, botany, zoology, physiology, arithmetic, physics, chemistry and history; and furnishes a motive and application for all useful forms of mental training. A recent agricultural text-book points out its advantages in teaching spelling, reading and literature.

The average city boy or girl surely misses more than one-half the meaning of such poems as "The Barefoot Boy," "Snowbound," "Gray's Elegy," "The Deserted Village," and a score of others that are full of rural allusion. So, for merely cultural and social purposes, the city child ought to have at least the opportunity for agricultural study. If manual training is justified in the city school in order that the child may have some opportunity to learn industrial processes that were formerly taught in the home, certainly the city school ought also to acquaint its pupils with the broader productive processes upon which the very life of the community depends. The pedagogical, practical, social and cultural reasons for teaching agriculture as the basic industry of mankind exist alike in all the common schools.

ON THE ROAD TO TOMORROW.

(Hon. Walter Williams, Columbia, Mo.)

Americans are born tramps. They never sit still. The excursion is the great national game. We are always on the road to somewhere.

In part the travel disease is inherited. Because there was a Mayflower, there are present day journeys. Because John Smith wandered over to the New Dominion—now called the Old Dominion—Kentucky came out of the wilderness and Virginia was born.

Traveling is contagious. The more people go away on tours and trips and excursions the more other people want to go. No farmer ever saw his neighbor hitch up his spring wagon to go to town without feeling tempted to get out his automobile and go too.

In larger sense, we are travelers on the Road to Tomorrow. The journey of life is for all travelers. The cradle is the starting point and the grave the destination—no, not the destination, it is only a bend in the road, beyond which we can not just now see. When we come finally to hear the funeral knell it is only a recess bell and school will soon take up again.

Along this journey there are scenes new and strange, experiences fateful and unfortunate. The itinerary takes in much that we do not expect when we start out and goes along new ways that we would not have chosen. The wise traveler over railroad or highway makes small complaint, takes what comes with smiling face and gets from each experience, sweet or bitter, all the good he can. So with life's traveler. If he be wise, he will keep stout heart and smiling face, whatever the rough or easy paths his feet must tread, however the clouds may overhang, or the crops be spoiled by an untimely rain, but will get the most out of life and be ready for any change in plans and for the last great change.

He has the present moment for employment to the full—the present moment, and no more. Yesterday is dead and tomorrow not alive. Yesterday is wealth expended, which is poverty, and tomorrow is riches unattained, which is poverty.

We are On the Road To Tomorrow. What that tomorrow will be this day decides. We lift our eyes to a new horizon every time we lift our eyes. Where Yesterday was wigwam and stone axe and spinning wheel, Today is palace for home, the electric current for candle light and carrier, the swiftness of a million weaver's shuttles. On the farm we have put away the reap hook for the reaper. In the school room we have laid aside the blue-backed speller for the scientific treatise. In economics we are turning from the ownership by one of the products of all to the ownership by all of the products of every one. In things intellectual, we have taken off the iron band of church and king which bound man's brain. A German monk opened the Book for all the people and an hundred church spires took the place of a single cathedral tower. A people laid obligation upon themselves to give schooling to every child and the school house became an important fact upon the Road to Tomorrow.

Whatever the changes, the Heaven bends with benediction just as near to earth this glorious day as when Wesley spoke or Carey suffered exile or Jacob slept on stony pillow or the Gallilean Peasant walked the highways of the Holy Land. And in the benediction of the bended blue is enwrapped the same unchanged, unchanging duties, the chief blessing which the Good Father gives to His sometimes reluctant children, blessing of opportunity for progress, for self-sacrifice, and for service. The Road to Tomorrow lies in the sunlight, not the shadow, and Tomorrow, please God, not Yesterday, is the world's golden age.

What may we see On The Road to Tomorrow? Each man makes his own horizon. The world is unlike to each different pair of eyes. To some, dollars show the largest on the road-side; to some, dinners. Some look always downward at the clods and become like unto them. Some lift their faces ever skyward and forget the weary way their brother goes, some look with love and level eyes direct into the face of every duty and seek to follow it with unfaltering feet.

As we pause upon the Road to Tomorrow, as we go forward on the road, what do we see most conspicuous objects worthy of our serious thought?

First, the red barn of the farmstead gives challenge. Filled it has been and is to overflowing. Lean years are forgotten in the fat years which have come. The output of the American farm aggregates annually eight billions of dollars, a sum that staggers the brain to comprehend—if at all it can be comprehended. Forests are felled and prairies are plowed, deserts are watered and the barn, big with agricultural wealth, is everywhere. Agriculture is fundamental, basic. The barn stands for agriculture. It is the symbol of the increased farm product. But the farm means more than the tearing down of sheds and the building of barns. Its problems are larger than the fertility of the soil, the conservation of material resources, than animal husbandry and horticulture, than agronomy and pedigreed corn. Fundamental problem in this first fact upon the Road to Tomorrow is how may the barn, typifying the wealth wrung from the soil, be best employed for the enrichment of the lives of the men and women who dwell upon the soil, how Missouri prairies may best uplift Missouri people. The growing bigness of the barn must mean less labor for the farmer and less for the farmer's wife, a broader, higher outlook for his sons and daughters, books and travel and college and spiritual life and character. The bigger the barn the less should it be the only discernable fact upon the roadside, nay, even the most conspicuous. It must be convertible into terms of service. Never is it an end in itself. There are other things on the Road to Tomorrow.

Next the factory, with its giant smoke stack, claims attention. Machines have supplemented, nay, almost supplanted hands. Why, cows are milked now by machinery and babies raised in incubators. The material civilization of a country may be judged by the number of its smoke stacks. The factory has come to lengthen and multiply men's arms. With the growth of the world's population, there were more mouths to feed. Some philosopher, thinking over the question, said there would be starvation in a century. Production could not keep pace with consumption, urged Malthus. The factory came because another man thought it into being and the philosopher's prophecy went unfulfilled. Where in the old days man was his own loom and blacksmith shop, making his own tools and clothing, he depends now upon others for their production. Yesterday an entire factory was carried under the individual hat. Today the most skilled laborer is but a cog in the great whirling wheel. Yesterday each wrote unaided, with long and tedious effort, the parchment pages of a book. To make this volume—paper, binding, type, press work, all—required a thousand interdependent hands, a hundred machines and a single day. With consideration of the factory comes consideration of the wage problem. The rights of capital and the wrongs of labor make a burning issue. The factory brings about congestion in the cities and the problems of the municipality press for solution. By combination captains of industry arise, commanding regiments of soldiers in the industrial army which feeds and clothes mankind. The captains clash with the soldiers and strikes and lockouts come. Men are thrown together on the Road to Tomorrow by the new industrial conditions. They do not live far enough apart to be neighborly. How they jostle each other by the roadside! Interdependenese succeeds independence. Man is no longer, if ever, self-made; he is society-made and bears in walk and look the hallmark of his multitudinous creator. We have come to the canned goods century. We depend upon the factory for our dress and for our dinners. Freedom from much physical labor has followed the development of the factory in modern life, but the new and startling problems which accompany it may well give even the most hopeful pause.

Distribution must follow production. Near to the factory smoke stack we find the telegraph and telephone poles. Cheap transportation pushes back the borders of our great cities, increases their population and their problems. Steam and electricity have annihilated distance. One touch of the daily newspaper makes the whole world kin. We could once see other peoples only with a telescope—and had no telescope—while now we have the world for a back lot. The re-alignment of the world's sky line, brought about by the changed condition of transportation marks a new era. The great round globe is field for the home missionary. Transportation re-maps the earth's surface. We have harnessed steam and extracted the sting from the thunderbolt to do man's bidding. Commerce has made a department store of all the globe and we may deal at will at any nation's counter. Production and distribution are upon gigantic scale. Man's arms are lengthened, his feet are given wings. A thousand Goliaths moulded into one would not make a single citizen of the twentieth century. Samson had no such power as the weakest woman plus an electric button. With this enormous increase of factory and railway has come a tremendous impetus to materialism. We have commenced to think in dollars. We measure manhood by Troy weight, by the assayer' scales. We count him successful who has a balance at the bank and set him down a failure who has not this, though all else beside. The voice which pleads for the idealism of simplicity is drowned amid the clamor for the things the factory produces and which steam brings to our doors.

Consequent upon factory and telegraph pole, accompaniment of production and distribution, the office building, a city within a city, is here upon the Road to Tomorrow. How high it towers. Jealous of any interference, it flings itself against the very blue. The office building typifies concentrated wealth, syndicated millions. The products of farm and factory are here controlled and the toll of transportation is paid into its coffers. What shall be done with swollen fortunes, with arrogant, predatory wealth? How may the problem of unequal distribution, of over-much concentration be solved? Those who prefer complaint to achievement may be content with hurling epithets, but others, eager to make the most for good of every great new fact, will heed the challenge that the throbbing office building brings, will seek to have it serve other purpose than the glorification of the dollar, the making of more millionaires.

Hard by the roadside is the schoolhouse, with its troops of children, the fathers of the morrow. The schoolhouse is larger than in olden days and better. This regiment of children who go in and out of its doors in this State is more numerous than the army which Xerxes led across the Hellespont to punish the city of the Violet Crown, more powerful for good or ill than all the soldiery of earth. We spend, and rightly spend, upon it more than we appropriate for any other public cause. A Rockefeller gives a king's ransom to a single school and it is scarce noticed amid the rising tide of gifts to education. Millions only are reckoned with, while a hundred years ago a great American college entered upon its endowment books with care and gratitude: "One soup bone—one shilling!"

Beside the factory and the railway station, with its web of wire, and schoolhouse and scientific laboratory, office building and red barn, the Road to Tomorrow holds church spire as well. Like index finger pointing up to heaven it stands. Man has gone from the primeval groves by way of tabernacle, mosque and temple to basilica and Christian church. He has built to the Eternal One a house with stained glass windows, through which the sunshine sifts on cushioned pews. Is the country church spire the rallying point for modern good? Or has it become a dying thing apart? Has the church risen to the needs of its new environment or does it yet linger on the horizon of Yesterday, groping amid the mists of mysticism and disputing about the cast-off garments of a worn-out creed? Man has put God within a splendid church and—has he left Him there?

Complex are the problems of civilization. Varied are the new demands. We Americans have placed for solution of many of tnese problems, for answering these new demands on the Road to Tomorrow the people's State house and there the capital dome. Beneath are met the people's representatives to serve the people. Rail as we may at the result of this or that election, complain as we may at that which comes from beneath the capitol dome, before America there was no election, no real republic, no free people, only a king and his subjects, a patriarch and his tribe. It is not strange, therefore, that those who come together under the capital dome make some mistakes, that laws are crude sometimes, that self-interest and party strife and greed of place or gain defeat, may only delay the coming of the best.

The last conspicuous object upon the Road to Tomorrow is that for which factory and railway, school and church, agriculture and commerce and government are made—the individual home. There are new problems in the smoke stack and the telegraph pole, the schoolhouse chimney and the tall church spire, the office building and the capitol dome. There is the old, old problem around the hearth-stone. The rising tide of materialistic thought and of scientific doubt is only dangerous when it engulfs the home. It is the new grouping that makes new problems. We live so near to one another. The shadow which falls athwart one threshold darkens many doors. The ideal of every statesman is a nation of happy homes.

We may not re-arrange life's roadway to suit the opinions we had Yesterday, nor shape it in accordance with the hope we have for Tomorrow. We must deal with it as it is Today. This is the challenge all along the Road to Tomorrow. The answer is that each must be made to serve all. No more must it be each for himself and the Devil take the hindmost. The call of the hour is for each to care for every other one and for all to take the hindmost.

The isolation of the farmhouse is relieved as it comes to share commercial privilege and obligation. The factory finds its place when it gives labor to many and the products of labor to many more.

Distribution is only worth while as it is agent of the millions, not merely feeder for the few. Except the schoolhouse train for public service, it has no right to state support. Except the church heal and help, it has no warrant for existence. Government means not the old order—if that be the order of spoil and steal, under form of law or without—but government means now—must mean the permitting to every man a chance—so far as law and honest wage and aggressive brotherhood may say, an *equal* chance.

As we use this day, this Road to Tomorrow, do we determine the days that are to be. Here we may cultivate the patriotism that means the common good. Here may we find that our interests are all woven into one; and that as commerce thrives, as manufacture plies its skillful hands, as labor is employed, as capital casts its bread upon the waters to find it after many days, so year by year with accelerating swiftness comes accumulating upon our State and upon all it bears or adopts, a finer life, a literature wider spread, the works of science and philosophy in the shepherd's hands, the canal boy's dream realized in a throne founded upon the suffrages and in the hearts of a free people. In olden days there was race from Marathon and games under the shadow of Olympus. But with every busy citizen of the State are our Olympian games—farmer, physician, engineer, merchant, lawyer, journalist, teacher, preacher. The races we run are with the head and not the feet. The wrestling matches are not of human sinews but of the forces of nature, grappling under the direction of human skill, with the fibres of the field, with the inertia of ores, with wood and stone, not to fling them to the earth, but to raise and train a million hand-servants of usefulness and luxury; and the prize is not a fading olive wreath, but that perfection of blessing, that dream of all other lands and lots—the American home.

On the Road to Tomorrow let us make right selection. To find out the things that are worth while and cling to them is highest duty and brings largest pleasure. Progress is largely a question of putting behind. There is nothing more tyrannical than precedent. It has murdered more progress than ignorance ever did. It is the man who does not remember—or more properly speaking, the man who knows how to forget what he remembers who pushes forward the world's work. Through all the thought on the Road to Tomorrow may well run the inspiration of an ideal the power of an idea, the appeal to a higher spiritual service.

In the early days of hypnotism a frail, delicate girl, with arm extended, was inspired by the hypnotist with the idea that her extended arm could bear great burden. Upon the arm was piled weight upon weight, weight upon weight, and the girl flinched not at the burden thus imposed. Finally the arm, still rigid with the inspiration of the idea, bended not, was torn from the sockets by the tremendous weight. The new education on the Road to Tomorrow will give skill to bear the world's burdens and will inspire the burden bearer with the higher suggestion of culture unto service. Thus no burden will be too heavy to be borne, for skill will give strength for every need, and if any bend or break beneath the burden their life imposes, they will yet be able to stand erect of soul, independent of mind, happy of heart, through the power of a great idea—the idea that skill and strength and culture are added unto men for unselfish service.

"In the fell clutch of circumstance
  I have not winced nor cried aloud
Under the bludgeonings of chance,
  My head is bloody, but unbowed."

The Road to Tomorrow is not a blind alley or a crossed main line. It leads somewhere. It leads to this day's duties and their fulfillment. We have it in our power. It leads to the Tomorrow. It makes that Tomorrow what it will. Looking through the day's glories and the day's gloom along the road just yonder ahead, I see the outcome of the toils of the hour, the lot of the toilers by the roadside. If I study the conditions of Today, I can see Tomorrow.

ONLY A DAIRYMAN.

(Hon. W. W. Marple, Muncie, Ind.)

Eugene Field, the very distinguished and ever-to-be-remembered American poet and humorist, whose production of "Little Boy Blue" made him famous and gave him a place in the hearts of the people of two continents and will perpetuate his memory throughout all time, was at one time the guest of royalty in England at dinner, where, among other delicacies there was provided an elegant, tempting dish of strawberries; the hostess, noticing that he did not eat them, said to him: "Mr. Field, don't you like strawberries?" He replied, "Yes, but I was just thinking how they would spoil the taste for—prunes. I am thinking tonight how this audience (after a rich treat of strawberries), have had their taste spoiled for—prunes; and I offer you my condolence for what you have to suffer, and my apology for having nothing to offer at this juncture of this wonderful banquet—but a dish of prunes.

I will ask you to remember that in my capacity tonight I'm "Only A Dairyman," and my hope of being able to make this dish of prunes more palatable is the furnishing of an abundant supply of good, rich milk and cream, by him whose cause I am delighted to champion, and in whose interest I responded to the request made by the Secretary of the Missouri State Dairy Association. Pardon me for repeating what I have so often said—that of all meetings I attend, a Dairy meeting in Missouri is the most attractive.

I recognize in the Dairyman an important personage, and he is legion; he is untrammelled by the boundary of any commonwealth or country; his appellation is as broad in its meaning as—mankind. In many sections the Dairyman is a—Boy. In England the Dairyman is a—man. In Scotland and Missouri the Dairyman is a—woman. A most striking illustration of this fact was given by the man who was asked by your former dairy commissioner how the dairy business was prospering in his section, and he said it wasn't doing very much good; that the women had got so "onery" that they wouldn't milk any more, and they had almost abandoned the business.

His business is not the creation of a fancy; it is the natural outgrowth of necessity with all of humanity; it is not a new business—it dates back with the beginning of history and from the time of the memorable feast given by Abraham, which was entirely from the Dairy, up until the time of the opossum banquet given to Taft. The Dairyman's product has been the most essential articles of diet at every meal. I have no dispostion to consume your time and worry your patience with statistics to substantiate a claim for the Dairyman's prominence; first, because it isn't necessary, and next, because I would refrain from anything that might give you the opinion of the deacon who met the preacher one morning at the church, who, having gotten wet coming through a drenching rain, said, "I'm afraid I'm too wet to preach this morning," and the deacon said, "O, never mind that. When you get into the pulpit and get to preaching you'll be dry enough." The sentiment that almost universally prevailed too long, and that still lingers in some localities and with some people, is such that the man who keeps cows is "only a dairyman"—a diminutive person, one of little consequence, and little influence. The cattle man and the horse man have been courted and catered to, while the financial and social world has given little recognition to the dairyman. The politician has cultivated the dispenser of whiskey and beer, and at the same time seemed utterly oblivious to the existence to the man who deals in milk. Laws have been enacted for the protection of dogs, while bills in the dairyman's interest have been laid on the table; the manufacturers of machinery have been protected by patents, organized trusts to govern prices; they have traveled on passes, and have been permitted to sit in the councils of railroad and trust magnates, while the dairyman has entered the markets that were open to him, unprotected and without attempted organization on price. He paid his own fare, kept his own counsel, fought his own battle, and his highest ambition has been a clear conscience and a prominent seat in the councils of his own family. The bank teller cleans the counter, and asks the crowd to stand aside when the tobacco raiser comes in once a year to make a deposit, and with his face one radiant smile he says, "The president would like to see you in his office for a little visit," while the patient, modest, dairyman who deposits his mite daily, waits for his turn, and is waited on by the collection clerk, and does his visiting with the janitor, all because he is "only a dairyman." The stockman, who markets his product once a year, when he goes into a mercantile establishment is waited on by the proprietor and gets a discount on what he buys, while the dairyman, who markets his product every day, transacts his business with the cash boy, and pays the regular price for what he gets. The banker, who does business on the dairyman's money, is importuned to buy an automobile, while the dairyman's mail is only circulars from the manufacturers of milk wagons. The dairyman can always be found at home, from necessity, while the grain-raiser goes every Saturday to visit his wife's people and stays 'til Monday. The dairyman counts the proceeds from his product in nickels, the wheat-producer counts his in dollars. The dairyman spends his summers in the pasture and feed-lot, and his winters in the cow-barn, the stock-dealer spends his summers on the lakes in the north, and his winters in California, Florida or Mexico. The dairyman takes his product to market in a tin can, the corn-raiser takes his in a box-car—one sells by the pint, the other by the carload. The dairyman has a steady job; his work never ends, while the farmer works four months and loafs the rest of the year.

These are some of the impressions and mental comparisons, and because of this I am disposed to be charitable toward some, for the conclusion they have arrived at, and my mission tonight is to reassure the Dairyman, and impress those who are not dairymen, with the dignity and the importance of the man's profession who is "Only A Dairyman," and if I am talking to a man tonight who is prejudiced, my effort will be the same as the little girl whose grandmother visited her home for the first time, and she said to her—"So you are my Grandmother, are you?" The woman said, "Yes, I am your grandmother on your father's side," and the little girl said, "You'll soon find out you're on the wrong side."

I would send this message to a legion of my Missouri friends, who are wearing out their land by drawing on its fertility and putting nothing back; you are on the wrong side. I am glad that sentiment has changed, and it is not so common any more to hear, he's "Only a Dairyman," and it is continually getting more frequent to hear of a man as "*Only* a Dairyman." There are many reasons why this question should be thoroughly analyzed, and I know of none paramount to your anxiety to help your boys to decide on their vocation. In the Black Hills, as well as in some sections of the west, the strongest secret organization numerically seems to be the Knights of Pythias, so when a young man begins to think of identifying himself with an organization of this kind, he naturally thinks of this, because of its popularity. In some sections the Odd Fellows seem to predominate; in others, the Red Men are strong, and in these different localities it is easier to interest a man in the Society that is the most popular. In some localities you find the strongest religious denominations Methodist, in others Presbyterian, in others Christian, and so on. In some communities you will find nearly everybody a professor of religion, and a member of some church, and there is no doubt the popularity of it has much to do with causing an investigation that ultimately leads to action. The endorsement of any proposition, by men of standing and influence, carries with it great weight. Some years ago when a Christian preacher was elected President of the United States the revival of interest in the Christian Church was apparent all over the country. Later when a Methodist was made president there is no doubt the Methodist faith grew in favor and many were added to the church. The same thing is true of politics. You are too well acquainted with the politician's tactics to even need a reference. A newspaper reporter once told me during a campaign that his instructions were to report every meeting of the same political faith, and whose cause they were championing, as having been attended by thousands, and full of enthusiasm, and those of the opponent's party with a very small attendance and no interest. What is the first thing a book agent or an insurance agent does when he solicits your business? He shows you a list of prominent men who have subscribed or taken out a policy. The committee raising money to build a church or feed the poor or for some public improvement, tries to get the list headed by the man with the greatest influence and the largest bank account. They want the biggest subscription on the top. The man who advertises, if he is honest, will never say anything about the volume of business he does unless it's large. So it goes, in every department and in every country. Human nature is the same, everywhere, and my plea tonight in the interest of the dairyman and his business, and more especially in the interest of a better country and in the interest of the boy who is undecided about staying on the farm is—Give dignity to this man who is ''Only a Dairyman,'' and popularity to his business, by your endorsement, and ''Do it now.'' Give him a place among the manufacturers of the world; welcome him in the council of finances; place him where he belongs in the public opinion, and the affect will be what it always is. The world loves a winner, and the people seek the successful side. In the fall of 1900 I happened to be in St. Louis and about 8 o'clock one evening I walked west on Olive street towards a crowd that was going into the Exposition building. I sauntered in, and found about a half acre of people, and I soon found that I had gotten into a political meeting. It was not long until the meeting was called to order, and a distinguished looking gentleman was introduced as the speaker of the occasion, and the very first utterance he made after straightening himself up to his full height was ''I am a Republican.'' You ought to have heard the crowd yell. You would have thought it was a wonderful thing to be a Republican. I learned afterwards that he was getting $5,000 a year for being a Republican. Two weeks after this I was called to St. Louis again, and in this same building they were having another meeting. I stepped in, and found about an acre of people. I soon learned that this was another political meeting; this meeting was soon called to order, and a man fully as distinguished looking as the speaker at the former meeting came forward and was introduced. His first utterance was, ''I'm a Democrat,'' and I thought something had happened. The shout that went up from that crowd could have been heard ten blocks. I learned afterwards that he charged only $4,500 a year for being a Democrat.

I had the honor of representing the State of Nebraska at a Farmers' National Congress. There was an immense crowd—an intelligent crowd. The great National meeting was called to order, the preliminary exercises were over, the orator for the evening introduced. He was bright looking, a man of reputation. He was a distinguished looking man—and his first utterance was, "I am a Dairy Farmer." The stillness was painful; not a response. The man who had educated himself in every branch that would fit him for any position; that great big speciman of health and happiness—one of nature's noblemen; that man who had chosen from all the avenues open to him what (to my mind) was the greatest profession in the category, and availing himself of this opportunity, in the presence of thousands of people, in the strength of his manhood and the glory of his high calling, to declare himself, not only a friend and advocate of the best organization in the world, but a member itself, and an enthusiastic believer in the justice of their cause; and, in all that vast concourse of people—not an audible response. My first thought was of my own boy who was just arriving at an age when he must decide what his occupation would be; with a strong inclination toward farming, and of course anxious to select one that would be remunerative and at the same time pleasant, he had but one guide that was prominent. He had a right to expect that his future could be seen in the reflection of the past of those who had trod the path that he was seeking. He could only judge of their contentment and satisfaction by their enthusiasm. I wondered, if he could have attended these meetings, what his conclusion would have been, as between a Republican and a Democrat and a farmer.

I am glad the time is past when the idea prevails that a man who is unfit for anything else can farm successfully, and that the poorest of farmers make "Only a Dairyman." I am thankful that institutions of learning are being established and are now being operated, where our boys can especially fit themselves for agricultural pursuits in a way that they may get pleasure out of their work as well as attain the most satisfactory pecuniary results. I am glad the time is past when we adopt measures in our business and pursue certain lines on our farms simply because it is in accordance with the policy pursued by our forefathers, whom, we are sure, were the best people on earth. We realize that this is no evidence of inferior judgment on their part, and this is no sign of presumption on our part. With the highest degree of respect and reverance for what we learned through this source, for the precepts and example that come to us from past ages, we simply appreciate that conditions are different in every particular, and it is absolutely necessary that methods should be changed.

I am told that years ago, up in the northern part of the country where I was raised, a candidate for congress started out on his campaign with a speech and a barrel of whiskey, and when he had a meeting he set up his barrel, knocked out the head, hung tin cups all around it, and invited the crowd to help themselves; and while they were doing this he expounded the gospel of that political faith to which he had subscribed. You couldn't carry on a campaign that way now.

The principal qualifications for a successful school teacher used to be strong physique and plenty of nerve, and all the school furniture he needed was a bundle of hickory. His greatest qualification may have been in knowing how to use them. Conditions have changed; the teacher may be diminutive, tender and sympathetic. In fact, the teacher may be a lady. The school furniture consists of maps and charts, globes and cubes, etc. A man may have been in the mercantile business in northern Minnesota and carried seal skins, wool-lined overcoats and heavy overshoes; he may have moved to Southern Texas and carried silk jackets, linen dusters, slippers and revolvers. This is no reflection on seal skins—conditions are different. This change in conditions is no less apparent on the farm. The changes that have taken place in the past thirty years are so great we can hardly realize that we are in the same country. In fact, if this change had not been gradual we would not recognize it.

Webster's definition of a Dairyman may have been a good one when he made his dictionary, but it don't cover the case now.

The twentieth century Dairyman may be to some, "Only a Dairyman." He may be and is one who produces milk and makes butter and cheese and deals in Dairy products, but he is more than this. He stands for progress, and in the evolution of Dairying he keeps abreast with the times. He is an intelligent man because he finds in his business the most remunerative market for brains. He is a reader of Dairy literature and a student of Dairy methods, because in his business "Knowledge is Power." He is not a loafer, spending his time at the cross roads store trying to regulate the government, but a man who attends strictly to his own business because he finds it profitable. He is a family man, a home lover and spends his time there because that's where his heart is. He is a soil builder instead of a soil robber, because his business enables him to return to his land the life giving force that has been taken by raising grain. He is a clean man, because his business encourages and demands it. He has written on the tablet of his memory, "Cleanliness is akin to Godliness," and in his social, as well as business life, he forcibly illustrates the truth of this. He is a home builder; a home provider, a home furnisher, a house decorator, a farm beautifier, because his business provides for him the necessary means, and the nature of his business is such as to develop a taste for the beautiful as well as the comforts of life. He is a temperate man, as well as chaste in his language, because the source of his income would not do business with him if he were otherwise. Besides this, he is a voter. He is a good dry goods and grocery customer. He keeps a bank account and he represents the highest type of American citizenship. He furnishes an article of diet that is not only a delicacy, but an absolute necessity for the completion of every meal. He provides for the motherless babe the only means of subsistance and saves to the world a precious human life—an immortal soul. He enters the sick chamber and the hospital wards, and with his product, the Elixir of life, he nurses back the emaciated victim of disease who is lingering on the border land of that country from which no traveler ever returns. He is the producer of the only balanced ration for the weak and the strong. He is the one indispensible manufacturer. He is of equal importance in the Palace of Kings and the hovel of the poor. His possibilities are limitless. He stands prëeminent and alone as a philanthropist as with daily regularity, he distributes to unnumbered voyagers nature's only life preserver, and he is "Only a Dairyman." Only a drummer boy, but in many a historic battle it was through the inspiration given by his music that urged a disorganized and terror stricken army on to victory that but for him would have suffered ignominious defeat. Only a newsboy, and we forget his importance as he hurries hither and thither crying the latest news and leaving at our doorstep, while the world is still asleep, messages from the remotest corner of the earth and making it possible for us at breakfast to get not only the political and financial situation in the new and old world, but the market reports from the commercial centers of the earth.

Only a clerk, and yet without him the wheels of commerce would stop. On him rests a responsibility no one else can bear. He occupies a position no one else can fill. He is the connecting link between labor and capital. It is he that oils the machinery and applies the steam that moves the great engine of commerce and transports the necessities and the luxuries of life from the few to the many.

Only a street car conductor, and yet he has in his charge thousands of precious lives every day, and as the great seething mass of humanity in the congested city go to and fro from home to business, and from business to home, he delivers them safely to their destination and as he crowds back and forth from front to rear, and from rear to front, collecting nickels and ringing the bell that announces another passenger, his eager eye is ever alert to dangers that surround. and with tender care he helps on and off the unprotected child and the aged that are infirm, and his only reward (aside from the consciousness of doing his duty) an occasional, thank you, and a dollar and seventy-five cents a day.

Only a telegraph operator, and through the long dreary hours of the night he directs the snorting, puffing, engine that hauls untold millions across the continent, and who would be in constant danger of disaster and death without his constant vigil. He who surrounded by water and in the very face of death apprized the world of a Galveston horror, and with almost super-human strength and courage, sits by his instrument and summons help to save a cargo of human lives that face a watery grave on a foundered ship.

Only a seamstress, and as she toils from day to day to clothe the world, with a compensation of a few pennies carrying to an humble home each night the meager provisions her earnings will purchase to appease the hunger of her orphan children, she deserves the plaudits of the enlightened world.

Only a farmer boy, and although his early life may be one of obscurity, he is preparing himself for future eminence, and as he tills the soil and plants the seed and reaps the harvest, he is happy in the consciousness of being one of an army that feeds the world and to him all honor is due, and as he breathes the pure air from Heaven and communes with nature and realizes his partnership with the God of the Universe, he developes into a manhood in whose house I would rather be a doorkeeper than to dwell among kings.

Only a Dairyman, and this opens to me a vision, and in it I see a million sturdy, intelligent, patient men feeding and milking and delivering to a world yet wrapt in slumber, the product from the faithful animals that are their special care. I see a million active boys as they follow the winding path twice a day in the summer and drive the cows from a distant pasture, and in the cold frosty mornings I see them skip to the feed lot and make "Old Red" get up quick so they can warm their bare feet that are almost frozen. I see the historic milkmaid with the milk bucket on her arm as she wends her way towards the cow lot humming a tune the like of which no operatic singer ever produced. I see the lonely widow woman in an obscure country struggling to maintain a home and keep together a family of children, and whose only hope is a small dairy herd and in her are all the graces of a true woman centered. On her brow is a crown of glory and her robe of righteousness is as spotless as the driven snow. To her is due the homage of a queen, and for these I come here tonight as their representative to ask your consideration and demand your recognition of those whose business is of such vital importance to America and the perpetuity of which means so much to Missouri.

While the lightning of wealth flashes across the Dairyman's firmament, and the thunder of oratory shakes the very walls of congress, let the Dairyman stay with the best protector from financial storms they have ever known, and you go and stay with the gods of war in the oleomargarine camp until the storm is past, and the Dairyman's sky is cloudless. A representative once asked a lawyer to draft a bill for a dog law, and he said, "Make it so it will satisfy my constituents, and won't interfere with the dogs." I would say to the Missouri representative, the opportunity is now presented for you to introduce a bill that will satisfy your Dairyman constituents and not interfere in any way with your constituents that are producers, and at the same time a direct benefit to those consumers to whom you are indebted for the position you occupy. Take advantage of conditions, and render this most valuable specific service, and there will be an abundant harvest for those who placed in your hands a sacred trust; don't let it be said of you what the boy said of his father when he was being coached in arithmetic to make a proposition plain to him. The teacher said, "Now suppose you would let your father have $100 and he promised to pay you $10 a week, how much would he owe you at the end of seven weeks." The boy said, "One hundred dollars." The teacher said, "I'm afraid you don't know arithmetic very well, and the boy said, "May be I don't, but I know my father."

As I contemplated the personnel of the audience that would assemble here tonight, and the different interests and pursuits and professions that would be represented, and as I read the program, and saw the different subjects that were to be discussed, I recognized in the request to respond to the sentiment selected for me, a tribute of honor and respect to the Dairymen of Missouri. I am not unmindful that the credit is due to a wonderfully increased interest in dairying, brought about through a combination of influences, the most prominent of which is this institution of learning, and the officers connected with it in various capacities. It is said that in Minnesota, when a man goes into a bank to borrow money, while the banker is asking him how much he wants and how long he wants it for, he looks out through the wicket at the man's feet, and if his boots are clean he tells the man he can get the money, but according to the rule of the bank he will have to get some good man to sign the note with him; but if he has milk on his boots he can get all the money he wants and don't need any signer. The Mason wears a square and compass badge; the Odd Fellow a three-link pin; the Woodmen an Axe; the cattleman wears spurs; the mule man carries a whip; the tobacco man is known by his odor; the miller has flour on his hat; the mechanic, sawdust; the brick-mason, brick-dust; the plasterer, lime; the shoemaker has holes in his shoes; the minister wears a white tie; the Doctor smells of medicine; the merchant is known by his emaculate dress, the farmer has hayseed in his hair, and the—Dairyman, with milk on his shoes has the only insigma of a profession that can borrow money at a bank without an endorser. A Dairyman in Minnesota without milk on his boots would look as unnatural as the distinguished lawyer who had his picture taken in a standing position with his hands in his pockets. He had a cut made, and when it was published in a paper, someone looking at it said to a friend "Ain't that natural," and the other man said "Not very, he's got his hands in his own pocket."

The life of a Dairyman is a strenuous one. If you are like the boy whom the minister asked what parable he liked the best, and he said he liked that one that tells about the man who "loafs and fishes" you had better stay out of the business. There is no loafing, and not much fishing in this business, although I have heard of a minna being found in the milk occasionally over in Indiana. Fellow Citizens, I am reminded tonight of that popular musical play, "The Time, the Place and the Girl." Synonymous with this thought is my impression of the Time at which this meeting is being held, as well as the Place and purpose. In the language of Herbert Kaufman, "Time, the Eternal Bookkeeper, is closing another Ledger." To me, it is a time for serious thought; the clock of time is striking the closing hours of the dying year; we will soon hold the pulseless hand of 1909, and at the same time feel the throbbing touch of the hand of 1910 as the New Year is ushered in with its bright prospects, joys and hopes of triumphant success. In the year that is gone, have we made the burdens of life heavier or lighter? Have we scattered sunshine or cast shadows? Is the world better, that we have lived? Some of us are at the base of life's mountain, while others have almost reached the top. As we balance our books to open a new account, let us profit by the mistakes of 1909, and avoid them in 1910. Let us do unto others as we would have others do unto us; let our motto be, "Do it now." The touch of human sympathy is like sunshine to the drooping flower. Let us lend a helping hand to the unfortunate; let us help to bear somebody's burden; let us prove to the world that we believe in the Brotherhood of Man.

It was an insignificant talent in the hands of a country boy, that was used with the skill of a master, that gave to America and to the world the immortal Lincoln. Talents are given to be used; let us cultivate whatever talent we have, and I know of no more appropriate place than here, in the shadow of this magnificent temple of learning provided for us.

In the evolution of Dairying I know of none whose experience of the past will enable them to reap a greater harvest, than the Dairymen, and I know of no opportunity greater, in assisting to bear somebody's burdens than is offered by the man engaged in Dairying. He doesn't have eternal sunshine; he finds thorns among his roses; he finds pebbles in his pathway, and while many of the obstacles have been removed by the effort of the dairy department of the State University, there are some who are yet unable to feed four per cent. milk in a three per cent. cow. There are a few who utterly fail to raise a calf on skim milk. There are others whose market for cream only pays for twenty-five per cent. when they are able to churn fifty per cent. Without anything to guide them, some dairymen have been floundering around with experiments, until they are as completely lost as the professor who was examining a dark brown substance on paper, when a friend called to visit him, and he asked his friend if he would kindly let him place a little bit of the substance on his tongue, as his own taste was vitiated from tasting so many. The man said certainly, and stuck out his tongue. The professor took a little of it and placed it on his tongue and the man rolled it around for about a minute as if he were eating something good. The professor said, ''Do you note any effect,'' and the man said ''No, none.'' ''It doesn't paralyze or prick your tongue'' said the professor. The man said, ''Not that I can detect.'' ''How does it taste,'' said the professor. ''Very bitter,'' said the man, then the professor said, ''Alright,'' and his friend said, ''What is it,'' rather suspiciously. The professor said, ''That is what I am trying to find out, somebody has been poisoning dogs with it.''

In conclusion, Members of Missouri State Dairy Association and Dairymen of Missouri, I would write on the tablet of your memory, the importance of your profession, and the responsibility it carries with it. You are furnishing to the climax of God's creative power immortal beings an article of food—an indispensable diet; your product goes to the homes of the rich and the poor; it is for the strong man who goes forth daily in his physical might to earn a living for a dependent family; it is the hope of life to the sick and afflicted whose last spark is flickering on the sea of uncertainty; it is the sole dependence of millions of infants, whose only hope of manhood and womanhood is the life-giving force that comes from your product; it is in some form on the poor man's table, and the rich man's banquet; in a hundred forms it has appeared on the table board this Merry Christmas and Happy New Year of millions of families all over the world. Are your cows healthy, and from them are you furnishing an article that will perform the office intended from the beginning of time; or are they diseased and are you sending to the homes of Missouri an article that will lay the foundation of distress by destroying the life-blood of the strong man who is the family protector and family defender; the bone and sinew of our country; or that will snuff out the dimly burning light of life in those who are so near the brink of the River that their only hope of resuscitation was in pure milk; or that inoculates with an incurable disease the life of the household, that blasts their hopes and causes a life of wretchedness and premature death? Are your barns clean? Are your milk utensils sanitary to prevent an unusual and unnecessary growth of bacteria that is deadly in its influence? Are you handling this product in the way you would want your food handled.

Is your cream kept in a perfectly sanitary place and do you dispose of it as often as you should; or do you keep it where you wouldn't like to have your pies kept and hold it until it is rotten to avoid an extra trip and then boast about being able to get as much for it as somebody who takes care of theirs and delivers it sweet?

Is your separator kept thoroughly cleaned every time it is used; or do you ease your conscience on the representation made by the agent that sold it to you, that once a week was often enough? Is your separator sitting where you would be willing to have your breakfast cooked, and is the cream kept in a vessel you would be willing to have your custard kept in? Do you sell good, rich milk as it comes from your herd, or does part of it come from the pump? Are you churning your cream and selling the skim milk by the quart and congratulating yourself that the inspector didn't catch you? Are you selling last summer's butter for fresh? Are you loyal to your own convictions? Are you loyal to the sacred trust placed in your hands by an overruling Providence and a confiding public? Are you true to the requirements of the statutes? Are you true to the voice of conscience? Are your books balanced? Is your record clear? Are your accounts straight? Is your business life an open book that can be read by the Dairy Inspector, the public and the supreme judge? Have you a good case? Is it prepared for the court of final decision? You have doubtless made mistakes; that is our common lot. In the language of Homer Wilson, "Let us square our accounts with all mankind and draw the mantel of charity over those who have misused us and as the sands of time fall into the grave of the departed years, let memory plant a few flowers of perennial freshness and beauty while the hand of love writes the epitaph of unforgotten virtues."

To you who are not Dairymen, what is your life? What have you done to assist in this battle royal for Dairy Supremacy in the grand old State of Missouri? What have you done to remove the stigma that caused the dealer to say, "The only objection I have to your butter is, it has Missouri stamped on the package?" What have you done to promote the cause and protect the interest of the Missouri Dairymen? Has the extent of your assistance been to kick on the quality and price of the butter that some faithful Missouri Dairywoman was delivering to you regularly? Have you been satisfied to amuse yourself while making sport of some poor scrawny pot bellied calf that had its hair turned the wrong way that you saw in some Dairyman's pasture and that you were satisfied was the outgrowth of an attempt to raise it on skim milk? Have you been content with making the pessimistic roar about the introduction of the class of cattle that would destroy the beef interest? If this is true my knowledge of Missourians is sufficient to warrant the assertion that if you have been adverse to Dairying or even negligent of Dairy interest it is thoughtlessness or from a lack of information. Let one of your New Year's resolutions be a determination to boost this enterprise. The Missouri mule has found a home in the cotton fields of the South, the lumber districts of the North and West and the commercial centers of the East. He may be seen on the streets of England's metropolis and in the mining districts of South Africa, and everywhere he goes he finds an active market for his services, and the strongest recommendation he has and the secret of his popularity is that he is branded "Missouri." The markets of the world are searched by commission men for the big red apple that is branded "Missouri." While we are proud of this we are not going to be satisfied to stake the reputation of a State like this on an apple and a mule. Although "Only a Dairyman" he has a long line of ancestors he may well be proud of and the Missouri Dairyman in my opinion lives on the very spot that Moses viewed when he led the children of Israel out of bondage. He belongs to an army of manufacturers that produced last year nearly a billion dollars. Let me leave this message with you tonight. It comes from the Dairymen who are not here. It comes from Missouri mothers whose duties at home preclude this privilege. It comes from Missouri boys full of hope, full of ambition. I bring from them an expression of gratitude for this recognition of their interest and for what you have done and what you are doing in their behalf, and Mr. President, members of Missouri University Faculty, Members of the State Board of Agriculture, Officers and Members of Missouri State Dairy Association, if I could tonight from all the languages of earth select the most expressive adjectives and weave them into garlands of praise, it would but faintly express the gratitude we owe you.

TEN YEARS' PROGRESS OF THE BOARD OF AGRICULTURE.

(Geo. B. Ellis, Retiring Secretary Missouri State Board of Agriculture.)

Brief mention of a few of the more important things accomplished by the State Board of Agriculture during the time I have been officially connected with the office may be of some interest and benefit to the farmers of Missouri, and particularly to those who are not entirely familiar with the work. The State Board of Agriculture is expected to aid in any legitimate way in the development of all lines of crop growing and live stock husbandry carried on in the State, as well as to encourage and promote the improvement of the rural schools and the farm home. The progress of any work of this kind running through a number of years is made a little, day by day, and is hardly noticeable as we go along, but by taking a retrospective view after a few years, the improvement should be easily discernible by comparison.

The Farmers' Bureau.—Instead of making long preachments to the farmers about what they ought to do, we have always tried to furnish them with some scientific information that would be helpful in their daily farm work. The farmer is as alert as any other citizen to take advantage of any economic information where he sees it is practicable. This policy has resulted in bringing thousands of farmers in close touch with the Board, and while hundreds of them have acknowledged the help they have received they, in turn, have been a great support to this office. Not all the investigations and improvements for the benefit of farmers have been discovered by the Experiment Station, but many of the most important have been made by the farmers themselves. It is as much the duty of the State Board of Agriculture and the Agricultural College to make themselves acquainted with best methods of successful farming and to make them known to the farmers generally as it is to set up ideals of their own; and this has been the policy of the Board during my incumbency. The State Board of Agriculture should be known as the

Unexcelled in size, Richness and Flavor. (From Booklet, "A Billion Berries.")

Farmers' Bureau of Information, through which the farmer may receive information on any subject relating to any phase of country life and through which he may in turn give to others any important discovery or demonstration he has made. As the result of this policy some of the most valuable bulletins we have published have been those containing reports of methods of successful farmers. Among these we might mention, first, the road drag bulletin by D. Ward King, a farmer of Holt county, Missouri. This bulletin has been printed in the fifth edition by the Board of Agriculture, and has since been published by the United States Department of Agriculture, and has in its essential features been printed by hundreds of newspapers and agricultural journals, and millions of copies distributed throughout the United States, Canada and other countries. Perhaps no other bulletin published by this Board, or any other board or department in the whole country, has been given such wide publicity, and no other has been of greater economic value. The two bulletins recently published on ''Pastures for Hogs'' and ''The Brood Sow and Her Litter,'' prepared by F. G. King, live stock assistant of the Board, and the one on ''Poultry Problems and Profits,'' prepared by W. L. Nelson, assistant secretary of the Board, and also the one on ''Farm Practice in Northeast Missouri,'' prepared by D. H. Doane, a graduate of the Agricultural College in the service of the United States Department of Agriculture, were the results of getting a consensus of opinions from the best farmers engaged in these special industries. Successful farm practice must rest on a scientific basis, and from these the wise experiment station man often gets valuable help and suggestions. The publication of the Monthly Bulletin was begun during my first year—1901—and has proved a very popular publication. The number of annual reports has been increased from 4,500 to 10,000 and, if the money were available for this publication, two or three times this number could be distributed to the great advantage of the State.

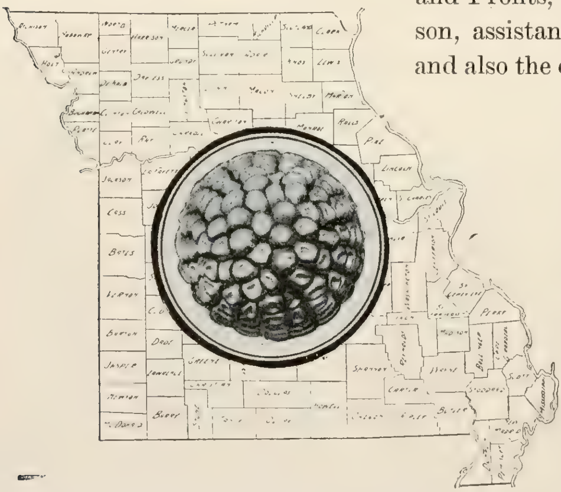


Illustration showing part of cover design used on booklett, "A Tip on Missouri Corn."

An original idea, inaugurated by this office, for the purpose of exploiting the natural advantages of Missouri and the State's pre-eminence in the production of certain crops, and advertising the progress of the State, was started last year by the publication of a number of monographs, which have proved a popular method of disseminating knowledge about the State. Four of these have been published up to this time, viz.: ''A Tip on Missouri Corn,'' ''Poultry Points and Profits,'' ''Testimonials on Missouri Roads,'' and ''A Billion Berries,''

Farmers' Institutes.—Through the Farmers' Institute meetings the Board exerts its greatest influence on the agriculture of the State. The improvement made in these meetings during the last ten years has been in the adoption of more systematic methods in conducting the meetings and in eliminating all but sound, practical instruction. During the early years of the farmers' institute work in Missouri, often four to eight lecturers were sent to one place to hold a meeting, but now it is seldom that more than two lecturers are detailed to hold a meeting, and many meetings are held with but one lecturer. It has been found more profitable to discuss one or two subjects thoroughly than to touch lightly on a number of subjects, better results following. A number of new methods have been adopted—some of them original with this office. One plan has been to hold meetings in the district school houses so as to reach the farmers not accessible to the towns. In holding these meetings one or two lecturers travel through the country districts and hold meetings with the school during the day and a meeting for the farmers in the evening. The increased inquiry for bulletins and the interest manifested in the corn contest work following the district meetings, is evidence of the good that has been accomplished. The institute exhibit car was first used by Missouri. It was first tried by the Missouri Fruit Experiment Station of Mountain Grove for the purpose of demonstrating methods in spraying fruit trees, and the first trial was made by John T. Stinson, then director of that station, who had a box car filled up with numerous spraying apparatus and gave demonstrations in spraying and mixing spray material to the farmers who gathered at stations along the route. Mr. Stinson was assisted by Colonel G. W. Waters, a representative of the State Board of Agriculture, who was the veteran institute lecturer of Missouri. This plan was next taken up by the Board of Agriculture and the Agricultural College, in co-operation with two of the railroads of the State. An exhibit car was fitted up with specimens of improved corn, wheat, alfalfa and other grains, grasses and vegetables, showing the work of improvement of the Experiment Station. These cars were used for two or three weeks each year, holding meetings and giving demonstrations throughout the territory traversed by the railroads. These exhibit cars grew into the special trains which have been used on a number of railroads in co-operation with the Board of Agriculture and the Agricultural College, and thousands of farmers have been interested in this way and much valuable information disseminated.

Farmer' Week in Columbia, which is a great convention participated in by all organized agriculture in the State, was instituted by the State Board of Agriculture and has proved the greatest factor in the development of the College of Agriculture and the Board of any of the methods that have yet been tried. It was largely through the influence of this convention, and agitation and organization by the State Board of Agriculture, that the magnificent new Agricultural Building was secured, as well as a greater and better equipment for the College. The first official demand for a Dairy Building, for a live stock barn, for an appropriation for improving the live stock of the State farm, for providing and fitting a show herd of live stock to be exhibited at the various expositions of the country, for establishing and maintaining a soil survey of the State, and other improvements, was made by the State Board of Agriculture in their recommendations for the betterment of the Agricultural College. These recommendations were followed up by organization and agitation of the Board, and appropriations secured to carry them into effect. Individually, I have always held that the logical way to bring about a better agricultural condition in Missouri is to build up a great agricultural college and experiment station that will be competent to give the farmer technical and practical information on any subject whatever that may bear directly upon the economics of the farm.

Illustration, showing part of cover design used on booklet, "Poultry Problems and Profits."

The one thing that has brought about the greatest improvement in farm practice has been the organization of corn growing contests and the education of the farmers on the subject of the improvement of the corn crop. Corn is the leading crop of the State, representing 50 per cent. or more of the total value of all farm crops. Believing that when a man is interested in improving one crop he will become interested in improving conditions generally, the Board of Agriculture made this the leading subject for institute work for several years. During the year 1903, in co-operation with the Missouri World's Fair Commission, a corn contest was held in every county in the State, and from that time until this, the subject of corn improvement has been made the prominent feature of most of the institute meetings. As a result of this movement, the State Corn Growers' Association was organized; also, many local associations; and doubtless millions of dollars have been added to the farmers' wealth on account of the increased yields of corn brought about by using better seed and giving better cultivation.

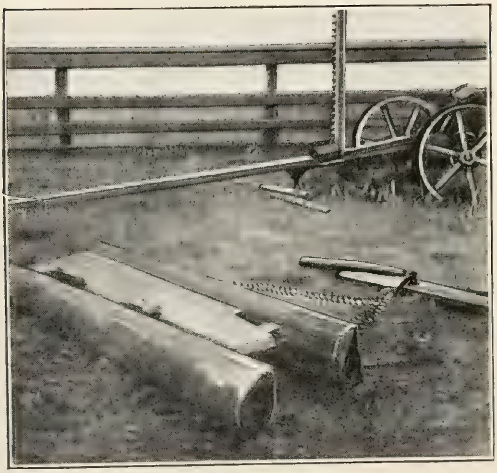
The holding of women's institutes has been organized during the last year and promises good results for the future. The greatest difficulty we have found has been to secure competent help, but the few meetings held during the past year have had very gratifying results.

The organization of the extension short courses, or six day institutes, for which a special appropriation of $12,000 was made to the Board by the 45th General Assembly, I consider an important advance made. A number of these meetings have been held during the past two years with an attendance varying from 200 to 500, and I look to this plan as being the one that will give the farmers the most substantial instruction.

The Farm Boys' Encampment, first organized by S. M. Jordan, farmers institute specialist of the State Board of Agriculture, has been the means of interesting several thousand boys in higher ideals of farm life and of calling their attention to the advantages offered them by the Agricultural College.

State Road Improvement.—For years no material progress had been made in the method of improving the roads in Missouri and the first important forward step was the development of the road drag which was begun by this office in 1901, and through the holding of road meetings and the giving of demonstrations throughout the State, the usefulness of the road drag created a demand for a better road system. In January, 1904, at a State Road Convention, held during Farmers' Week in Columbia, the writer outlined the following plan for a better road system in Missouri: The establishment of the office of State Highway Engineer as a department of the Board of Agriculture; the creation of a State road improvement fund to give State aid to the counties in making permanent improvement of the roads; giving authority to the county courts to levy 25 cents on each $100 valuation for the benefit of the country road fund; creating the office of County Highway Engineer to be appointed by the county court.

Every one of these suggestions was adopted by the convention as a road platform, and this was followed by an endorsement from a number of road conventions held by the Board of Agriculture in co-operation with various county courts and commercial clubs throughout the State. Sentiment was thus created in the State that caused the enactment by the 44th General Assembly, in 1907, of laws carrying every one of the propositions recommended into effect. This required the enactment of several laws and the submission of a constitutional amendment providing a State levy for State aid for permanent roads, and making a State appropriation of nearly one million dollars. All of the above measures are now in operation except the constitutional amendment providing money for a permanent State road fund, which failed of adoption by only a small majority, but the following legislature resubmitted the proposition, and it will be voted upon at the next general election, with good prospects for its approval. It might be well to explain here that this failure to secure money for the State good roads fund was not the fault of the Board of Agriculture, neither was it the fault of the members of the legislature, or the general sentiment in the State, but was an unforeseen condition arising because of the increasing demands upon the State revenue fund. Progress in road building has been retarded because of this lack of funds, but not altogether stopped, a number of counties having gone ahead and improved some of their roads in a permanent way. A general improvement is seen in the counties in the way of building better bridges and particularly a greater number of concrete bridges, and a general saving in the cost of administration in road work. As soon as a producing State road fund is provided, the good effects of our present system and the work that has been done up to this time, will become progressive and permanent.



One of the farmer's road tools—"The Missouri Idea."
(From booklet, "Testimonials on Missouri Roads.")

The veterinary department of the Board has secured larger appropriations and new legislation, the most important of which is the law providing indemnity for cattle condemned and slaughtered on account of tuberculosis.

Every one familiar with the progress that has been made, fully appreciates the general awakening that has taken place during the last ten years among the farmers of the State and their changed attitude toward the work of the Board and the College of Agriculture. It has changed from much fault finding and criticism to support and hearty co-operation.

NEW METHODS IN AGRICULTURAL EDUCATION.

(G. I. Christie, Purdue University Agricultural Experiment Station, in address at Missouri Farmers' Week, December, 1909.)

The subject of agricultural education is receiving much attention at this time. At almost every meeting of agricultural organizations, educators and business men, some phase of this subject is discussed. It is before the people in a strong way and is moving them to action.

Men of the prominence and calibre of J. J. Hill of the Great Northern Railway, and President Brown of the New York Central are actively interested in the agricultural movement. They are pointing out existing conditions in agriculture and what the morrow is to bring and are emphasizing the need of applied information in the handling of the soils and crops not only for the welfare of the farmer, but for every class of the entire United States.

In America today there are many resources upon which the wealth and trade of the country is based. Among the more important of these are the forests, gold mines, silver mines, oil wells, gas wells, coal, iron and copper deposits and a complete net work of water ways. Of this wealth the country boasts and with it as a backing has taken a front rank among the nations of the world. Upon these resources many industries have been developed, which engage and return a livelihood to more than sixty millions of people.

Important as these resources and industries are, they are directly dependent upon agriculture. No matter what work or reward they may offer they are not productive of food. Remove the source of food supply and the value of other resources drops to zero. Therefore the Illinois slogan may be worded to include the entire country. ''The wealth of the United States lies in its soil and the strength of her people lies in the intelligent management of it.''

At present we hear much said about high prices of food stuffs. People everywhere are protesting against the cost of living. The clamor is loud and will likely be prolonged.

The causes of high prices are many and complicated. To discuss them at this time is a temptation, but space and time will not permit. However, it is generally believed that the main causes of high prices are increased demands and increase in the cost of production. It is estimated that the annual increase in population in the United States is more than two millions. It is also estimated that to feed these two million hungry mouths, seventy-five million bushels of food producing cereals are required. When it is remembered that the limit of new and tillable lands in this country is almost reached, one must conclude that the land already under cultivation must be made to produce this extra product. Just how this can be done is one of the problems before the people and a question upon which they are eagerly seeking information.

This call and demand for information was anticipated many years ago by a body of men in the United States Congress directly interested in the welfare of agriculture. They were intimately acquainted with the problems of the farmer and foresaw then the trend of this occupation. Through the passage of the Hatch Act in 1887, which established an Agricultural Experiment Station in every State and territory of the Union, much was done to meet the conditions which exist today. At each Experiment Station a corps of scientific men were employed in the study of soils, crops, horticulture, dairying, animal husbandry, botany, and entomology. These men did earnest, hard work and have solved many of the farmer's problems. The facts derived from scientific research have been given a practical application and today the farmer is in a position to reap the results.

Corn Judging, District Farmers' Short Course.

Just how Experiment Stations have secured helpful information and how this information can be directly applied in farm operations can be illustrated by work which has been done in Indiana.

In Northern Indiana there are more than a million acres of muck land. On this farmers were unable to grow corn successfully. All attempts resulted in failure. The Experiment Station took up this problem and after some investigation found that it was lacking in one of the elements, namely, potash. On several farms plots were laid out and muriate of potash applied to some of this soil. The result was that in four years ninety-six bushels more corn were grown on each acre treated than were grown on the untreated soil. The cost of treatment was about three dollars per acre. The returns were more than $45.00 per acre. Much time and effort was required to discover this one fact, but now when applied it means many thousands of dollars annually to the farmers of the State.

The Animal Husbandry Department of the Purdue Experiment Station has been doing some interesting and valuable work in feeding cattle. They are attempting to place the cattle feeding business of our State on a profitable basis. Their first movement in this connection was to determine the value of the practices followed by many feeders in the State. After some investigation they found that there were two common rations fed by different feeders. One was corn, corn fodder, and oats straw. The other corn and clover hay. The study of these rations shows that the latter, corn and clover hay, is more or less balanced, having a large amount of protein added through the clover hay. The first ration is one sided, containing no carrier of nitrogen or protein. The Department purchased two car loads of steers on the Chicago market and fed them on the above rations for one hundred and eighty days and the result was that the lot receiving corn, shredded stover and oats straw required 13.4 pounds of corn to produce one pound of beef, and when sold on the market returned a profit of $1.14 per steer. The second lot receiving corn and clover hay required only 9.4 pounds of corn to produce a pound of beef and returned a profit of $8.62 per steer. In Indiana of that year more than sixty thousand steers were fed. If by proper feeding a profit on each steer of $7.50 could have been had, it would have meant more than $450,000.00. This is many times the amount appropriated by the State to the Purdue Experiment Station.

Similar illustrations could be given in farm crops, dairying, horticulture, etc., but the above is sufficient to demonstrate that the Experiment Stations are securing information, which if applied in farming operations, will mean much in increased returns to the farmer. It also demonstrates that in this movement for agricultural education there are many things at hand which can be well extended to the advantage of every one interested in agriculture.

For some long time the results of agricultural research and investigation have been carried to the farmer through bulletins and agricultural papers. These have done an untold good and they are still a necessary factor in the movement for better agriculture. However, we must admit that owing to the fact that farmers do not apply in any direct way what they read, these publications have not accomplished all that could be desired. For these reasons and in order that the farmer might be brought into closer touch with helpful information pertaining to farm operations and in order that he might be encouraged to apply directly the principles and facts, several new movements have been inaugurated. A few of those taken up in Indiana during the past few years will be cited.

EDUCATIONAL TRAINS.

The first important movement taken up by the Indiana Station to reach the farmers of the state was the running of a corn train. The first corn train was run in December, 1905. Since that time corn trains, soil trains, horticultural trains, and dairy trains have been run over almost every line of the state. More than 150,000 people have been reached in this way and the publications of the Experiment Station placed in their hands. In the educational work the train has been a most important factor. Through it people have been aroused and their interest directed to the subject of agriculture.

Address on Corn—Corn Train.

While the information given on the train has been very similar to that given by Farmers' Institutes and bulletins, yet when these same facts are backed by a railroad corporation and given the momentum of a train rushing through the State, they take a new form and strike deep into the hearts of the people. The teaching is given a force that the most suspicious and hardened individual is not able to resist, and a further and most important result has been that people have gone home and put into practice the facts they have gained. The problem of carrying to the people is not nearly so important as is the one of getting people to do those things which they already know.

At first it was felt that the train could be used only to arouse people, and would not educate directly. This view has been changed and the train in Indiana educational work has come to stay. Through it we are able to reach the people and to give them work, which they are taking and applying in their every day operations.

DISTRICT SHORT COURSES.

During the past eight years Purdue University has conducted a one week's Farmers' Short Course, giving in this course practical instructions in corn, live stock, dairying, horticulture and domestic science. The work has been of untold value and has appealed strongly to the people of the state. During the past three years there has been an annual attendance of more than 1,200 farmers, which proves that the course is popular.

County Farmers' Excursion, Purdue University.

While we feel that this course is reaching a large number of farmers, yet when we think that there are more than 225,000 farmers in the state of Indiana, we must admit that the number reached through the short course is very small. There are 1,100 townships in Indiana, which means that we are reaching about one man from a township. Again, when we think that the men who come to these courses are the most progressive ones and that the man who has low yields of corn and wheat and who feeds his cattle and hogs at a loss, does not attend these courses, we are forced to conclude that the course is not solving in any large way the problem of these people. When we realize that this course is of value to the 1,200 farmers who attend the Purdue Course, we ask ourselves the question: "Would this course not be of value to every farmer in the State?" If so, why can we not outline some plan by which these people may be reached. If they cannot be brought to the State Institution, can we not carry out to them this form of instruction. With these thoughts in mind the district short course was suggested. That is, a course similar to the one week's course given at Purdue University is being organized at some central point in each of the congressional districts of the State.

The work is so arranged that the farmers may come from their homes in the morning and return in the evening. In this way they are able to care for the farm work and at the same time attend the course. One must admit at once that this form of extension is very expensive. This is true, but by charging each one who attends the course a membership fee, the expenses of the work are entirely covered by the district in which the course is held. In this way, our institution is at no expense other than the salaries of a few of the men who conduct the work.

That these courses are popular and are reaching the people, is clearly demonstrated by the large attendance. At Evansville, Ind., recently, more than 2,100 farmers attended the course and took the work throughout the entire week. It is our belief that the district short course will fill a long felt want and will do much to extend the usefulness of our Agricultural Institutions.

YOUNG PEOPLES' CONTESTS.

While it is generally felt that to increase production and the returns of the farm today, it is necessary to work with the older people through Farmers' Institutes, District Short Courses, Agricultural Trains, etc., still the boy and girl of the farm must not be overlooked. The hope of future agriculture is in the young men and women, and anything that can be done to place them in closer touch with this life means much.

On every hand we have people giving advice as to how to keep the youth on the farm. These people appreciate that the man who is tilling the soil today must soon give up his work, and that he must be followed by a young and well trained man. Recognizing all this, our people in Indiana are making an attempt to reach the young boy and girl in the school and to so direct their attention that they will consider farm work and farm life the best there is.

Recently there has been much talk in Indiana of securing a law which would cause agriculture to be taught in all the schools of the state. Because of the fact that it is impossible to secure any number of teachers who have any knowledge of the methods of teaching agriculture, and for the further reason that this subject cannot be taught in a satisfactory way without the teachers and pupils having the proper spirit and attitude, this plan has not met with much favor. With the thought of interesting the boy and girl and at the same time the county superintendent and school teachers, Purdue University has inaugurated the Young People's Contests. The boy is encouraged to grow a plot of corn while the girls bake bread, make butter and sew. During the season the institution furnishes to these young people literature which relates directly to the work they are doing. These young people study the subjects that they may be better qualified to do the work they are engaged in, while the teachers and parents read and study the litera-

Boys' and Girls' Club, Salem, Indiana.

ture in order that they may be qualified to answer the many questions that are asked of them by the boys and girls.

We feel that when a teacher is discussing the principles of corn growing, butter making, bread making, and sewing, that they are teaching agriculture in the very best and a most profitable way. This is not only theory, but it is working out in the schools of Indiana exactly in this way. The clubs have brought agriculture into the schools. Without any discussion among the people and teachers, we are accomplishing without a law that which is most desired.

The work of these clubs is also bringing the boys and girls into closer touch with the work that their fathers and mothers are directly engaged in. These contests are changing the viewpoint of our boys and girls. They think of corn growing, butter making and bread baking, not as drudgery, but as work which is full of interest and which requires the highest intellect to secure the best results. In their study of the subject the labor entailed is forgotten.

In connection with these contests, a show is held when the product of the season's work is exhibited for premiums. The corn, bread and butter, etc., are scored by experts, and the boys and girls are then able to see just where their product is strong or weak. The premium given in these contests is very important. It is our belief that these should be educational. The offering of large cash premiums has not proved a satisfactory practice. In these contests, we suggest that the first premium in each class be a trip for the winner, with all expenses paid, to the Purdue Farmers' Short Course. The boys and girls who receive this trip are placed in a special class under competent instructors at Purdue, and are given interesting and valuable instruction throughout the week. At this course the boys and girls come in touch with a great educational institution, their view of the work of the home and farm are widened, and they go back into their schools and community filled with inspiration and enthusiasm, which means that they have not only been started on the right path, but they interest every other boy and girl with whom they come in contact.

EXHIBITS.

As a means of presenting in a direct manner the work of the Station and School of Agriculture, county and state fair exhibits are employed. Through these exhibits an attempt is made to place before the people the results of the various lines of work. This is accomplished by means of grains, fruits, soils, feed stuffs, fertilizers, large charts, photographs, etc. The materials are so arranged that they tell a story that the visitors can readily understand. Experts from the several departments attend the exhibits and assist visitors in gaining from the displays the information desired. These exhibits have been helpful and beneficial and have done much to place the results of agricultural investigation before the people.

DEMONSTRATIONS.

Another way of urging farmers to adopt new methods is through practical demonstrations. This year we have given more than seventy-five practical horticultural demonstrations in various parts of the State. The people of the counties are brought together at some convenient point in an orchard. Here spraying apparatus and spraying materials are assembled and a spraying demonstration given with full information, as is the making of the mixture and the applying of the same. A full line of pruning apparatus is also carried and a demonstration given on the methods and value of pruning fruit trees. This work has proved especially helpful and beneficial.

From the effects of smut in wheat and oats Indiana farmers have experienced a great loss in recent years. It is known, however, that this loss can be reduced to a minimum through the use of formalin. The Extension Department aims to secure the co-operation of grain dealers and sends a demonstrator to the point where the farmers are gathered and gives a demonstration on the treatment of oats and wheat for smut. This work is done immediately preceding the time of seeding. It is found that large numbers of farmers are induced to treat their seed. The results from these demonstrations is bound to be large.

Horticultural Demonstration Meeting.

COUNTY FARMS.

For several years the Station and School has conducted experiments and demonstration work on several county farms of the state. Tests of varieties of corn of the county are made on these farms. In this way an opportunity is given the people to see and learn just what their variety of corn will do under the same soil and climatic conditions as corn from their neighbor's farm. In one county last year it was found that one man's variety of corn produced at the rate of 108 bushels per acre, while a neighbor's corn, grown right beside it, only produced 66 bushels per acre. These varieties were planted on the same day with the same planter, were thinned down to two stalks per hill, and had exactly the same number of stalks. They were harvested on the same day and weighed on the same scales and a difference of more than 42 bushels per acre was obtained. From this we must conclude that the difference was in the variety. This is but one instance that has been duplicated several times.

Picnic at County Farm—Address on Year's Work.

When farmers have this work demonstrated in their own county and under conditions exactly similar to theirs, they are impressed with the results, and for this reason the county farm has proved of great value in emphasizing many points. On these farms tests of varieties of small grains and fertilizers are also made.

From the foregoing some idea may be gained of the methods employed and the scope covered in attempting to place before the people information pertaining to agriculture. Through it all we are trying not only to extend information, but to present the facts in such a manner that they will appeal to people and move them to action. The value of the work lies not so much in offering new ideas or truths as it does in impressing the people with the importance of doing those things which should be done.

THE FACTORS CONTROLLING CORN YIELDS.

(M. F. Miller, Professor of Agronomy, Agricultural College, University of Missouri.)

The great importance of corn as a cereal crop in the United States, its increasing economic value, and the gradual failure of our soils to produce satisfactory crops under constant corn cropping warrant the most thorough study that can be made as to the factors which control the yield per acre. In the broader aspects of the case, consideration must not only be given to those factors which limit production at the present time, but also to those which shall affect its production for future generations. For in spite of the continued reports of large production by our crop reporters and by the optomistic periodicals, the fact remains that with the present rate of increase in population, our methods must be rapidly improved if the cost of food materials is to be kept at a basis which will allow of continued contentment and prosperity among the masses. The advancing price of all food stuffs during the last decade, is sufficient evidence that we have no overproduction. It is true that large areas of land still remain to be developed, but the undeveloped areas which are adapted to corn culture particularly, are comparatively small, and an increased yield per acre and a more economic handling of the product in the production of meats is the only solution. Corn has for years been the basis of our prosperity, and while this has and is still largely used in the production of live stock, it is today taking a much larger place in the manufacture of all food stuffs for human consumption than ever before. Ultimately, the American people will make much less use of meat than at present, and the recent appearance of 11-cent hogs on the Chicago market cannot but have its effect. Doubtless this is more or less temporary due to a variety of causes, but the fact remains that our consumption is rapidly overtaking production, and with corn, as well as with other products, we shall be driven to a higher production per acre. It, therefore, behooves us, as producers of food stuffs, to know more of our business, to understand more fully the factors which limit our production and to so improve that our yields may be increased, and not for this generation only but for the generations that are to follow.

The factors controlling corn yields, broadly speaking, are those of season, of soil and of methods of culture. The character of the seasons is, of course, not within our control, yet a thorough understanding of the handling of the moisture which falls will go a long ways towards establishing uniform conditions in this respect. And in no section of the country is this better understood or the knowledge more judiciously applied than in large parts of your own and neighboring states. We hear a good deal about changing seasons, of a permanent increase in rainfall over the west, but no one should be deceived. The seasons have not changed permanently. The record of the Weather Bureau shows that certain cycles of high precipitation follow more or less similar cycles of low precipitation and that when a fifty-year period is considered, these cycles alternate with greater or less uniformity. We cannot depend, therefore, upon any supposed change of season as permanently bettering the condition of the farmer. The wise thing to do is to study carefully all methods of moisture control and depend more upon our ability to provide moisture or drainage, as the case may be, rather than upon the weather.

Undoubtedly the rainfall is the most important factor now controlling corn yields. As a class, we have not yet learned the handling of the moisture relations of our soils. We depend too much upon chance, upon the season, and this is strikingly shown by the average corn yields of the country. When the season is favorable throughout the corn belt, the average is high. When it is unfavorable, the average is low. We must learn to control the supply of moisture better, as well as to handle our soil fertility and our methods of culture better if the average yield of corn is to be permanently increased.

The second great controlling factor in our corn yields is that of soil fertility. No crop is more dependent upon a fertile soil for its profitable culture than is corn. It has been the fertility of our corn belt land coupled, of course, with a favorable climate that has made this the corn growing country of the world. But the way we have been abusing these lands, wasting our heritage, as it were, has been shameful. Not that I am blaming the individual farmer nor the farmers as a class, because this has been purely the result of natural conditions. We took up this land when it was new. We were pioneers. We had the speculative training of a new people in a new country. We were raised to think that it was our just right to get all from the soil we could without regard to the effect upon the future generations.

The matter could not have been worked out otherwise. We were compelled, under stress of circumstances, as well as impeled by training, to do as we did, and land has been cropped to corn year after year, or too commonly with only an occasional grain or grass crop thrown in until it has begun to show a great decrease in productiveness. The poorer lands felt it first, then those of medium fertility, and now the rich soils which farmers were wont to style as inexhaustible, have begun to show the effects of this persistent grain growing system. Now couple with this the rapid increase in the value of farm lands, at the same time that their fertility has been waning, and we are brought face to face with the fact that something must be done from the standpoint of profitable production even with the present high-priced products if we are to make a good return on our investment. It is true, that with a series of good seasons during the late decade, and with the increasing prices of products farmers have, many of them, made money, but consider a few unfavorable seasons with the soil fertility already considerably exhausted, consider, too, a probable slight decline in the prices of farm products, and either land values must decrease or we must increase our acre production to make the business profitable. And in this connection nothing is surer than that we must give greater attention to an increased soil fertility, not only for the farmers' welfare, but for the welfare of the people as a whole.

We must learn to handle systems of crop rotation, we must know the value of a ton of manure, and how to apply it; we must study the systems of handling legume crops—clovers, cowpeas, alfalfa; we must learn the proper handling of commercial plant foods. No one of these things alone will permanently maintain our corn and other crop yields or maintain our soil's productiveness for our children. Here in the middle west where our soils are naturally fertile and where the system of soil robbery has not yet gone so far that the building of these soils is an economic impossibility, we should set about at once to create a sentiment by word and by example which shall mean the permanently increased productiveness of our lands. Upon this more than upon any other one factor the yields of our future corn crops will depend.

The third important factor in determining corn yields is the methods of culture. And here I wish to be more concrete and to call attention to some of the more practical considerations involved in the profitable production of corn. Last year the Missouri State Board of Agriculture compiled from the reports of a large number of farmers the cost of the various items involved in the production of an acre of corn, and I give the results in the following table:

COST OF GROWING ONE ACRE.

For plowing, including previous preparation	$1 52
Preparing the land after plowing	66
For seed, improved quality	37
For planting	33⅓
For cultivating	2 12
For harvesting, the grain only	2 26
For cash rental	5 00
Average cost per acre	$12 26⅓

As will be seen from this table, the cost of producing one acre of corn in Missouri, according to these estimates, is $12.26, which, at the present price of corn equals the value of 20 bushels. In other words, it requires 20 bushels of corn to pay the cost of production and the rent of the land, even at the present high prices. Now, the average yield of corn in the United States for the last decade (1900-1909) has been 27.5 bushels, which means that the average net return from an acre of corn when the country as a whole is considered, is $4.50, if we allow a valuation of 60 cents on the bushel and the cost of production, to stand at $12.26. This, of course, means that at least one-half of the farmers of the country have been producing less than 27.5 bushels, and a large per cent. of them less than 20 bushels per acre. It is true that the cash rental in the estimate is figured high, when the country as a whole is considered, but it must also be remembered that the present price of corn is also high. If we figure the average price of corn for the last 10 years, we will find that it required 25.8 bushels to pay for the cost of production, so that we cannot escape the conclusions that a great number of farmers are growing corn at an actual loss.

The average yield of corn in Missouri for this same period has been 28.6 bushels, thus giving an average excess over the 20 bushels figured as necessary to pay the cost of production of 8.6 bushels, worth at the average price for the period, $3.83. It must be remembered, too, that in this estimate no account is taken of the loss of fertilization to the soil resulting from this corn cropping, which must be given careful consideration if our lands are to remain permanently fertile.

It might seem at first thought that the remedy for this condition would be a decrease in the cost of production, but it must be remembered that with our modern tools corn is being produced today cheaper than ever before, and there is little hope of greatly decreasing this cost. There remains but one solution, and that is, that the acre yield must be increased, and to do this, the cost of production must be increased rather than decreased. We must spend more time in soil preparation, more time in cultivation, and we must pay higher prices for the seed we plant. And we must learn how a dollar so invested can be made to bring two or more dollars in return. With this, too, must go the maintaining of our soils in a higher state of fertility, thus making it possible for the improved methods of culture and the improved seed to bring their proper return.

In the discussion of methods of culture, I cannot cover the whole field, but I shall content myself in pointing out some of the more striking features which are either too commonly misunderstood or neglected. In the preparation of land for corn, farmers, as a class, have been content with too shallow plowing and too little attention to the preparation of a seed bed. We cannot grow good crops of corn on land broken three or four inches deep unless the soil is very rich or the season exceptionally favorable. The time was when our soils were new that this matter was of less importance, but with a decreasing fertility we must lend every aid to the corn plant in order that it may yield abundant return. A deep mellow seed bed for the spread of the roots of the young corn plant is very essential and the more mellow this seed bed, the better.

A feature in soil preparation that is taking considerable hold in Missouri and surrounding states is the disking of land before breaking, especially where the land is spring plowed. Where corn follows corn there is no better method of handling the stalks than the use of a heavily weighted disk harrow, which will chop them up and at the same time loosen the surface soil, thus making the plowing one horse lighter and giving a loosened layer of soil to turn down instead of the clods which too often exist. Such a system gives that mellow seed bed so much desired and allows of a depth of breaking not easily secured without it. The same system is being followed on sod land, particularly clover sod, with excellent results, and even on heavier sods, such as blue grass, it is being used with marked success.

Where such disking is done early, especially on stalk land, it has another important value in allowing a greater absorption of moisture to tide the corn over the dry period of late summer. In this case, if the land is not rolling as to allow serious washing, the fall disking of land which is to be spring broken, would be of great value in holding the winters' rain and snow.

The value of thorough preparation of the seed bed after breaking is too well known to need discussion here. The old saying, that corn should be half tilled before it is planted, contains a great deal of truth. Too often our farmers do not fully appreciate this and stress of work or unfavorable weather conditions prevents that thorough preparation of the seed bed that it should have. This is another of the items where a dollar spent brings two or more in return.

Another important factor not thoroughly appreciated in many cases is the necessity of a uniform stand of corn secured by using only strong growing seed and distributing it evenly with a properly adjusted planter. And in this connection I wish to call attention to the mistake too frequently made of planting corn too thick for the fertility of the land. When we stop to consider that an average of two stalks per hill 3 feet 8 inches each way, each stalk bearing a 12-ounce ear, means a yield of 70 bushels per acre, we gain some idea of the possibilities of an even stand of good stalks planted thin. It takes practically the same amount of moisture and almost as much plant food to produce a stalk bearing a nubbin as it does one bearing a 12-ounce ear, and where the thickness of planting is three or four stalks per hill on land in which the plant food and moisture are both insufficient, the results can readily be foreseen. Of course, on soils where both plant food and moisture are abundant the thicker planting is desirable, but on the bulk of our corn lands today, the thinner planting is best. It is true that this far south the stalks tend to grow large, and this tendency is somewhat intensified by the thinner planting, but it will usually be best to secure varieties that are somewhat less rank growing, plant them at only a medium thickness and then give them the cultivation necessary to conserve the moisture required for the production of one good ear per stalk. The tendency is growing throughout the corn belt to plant corn of strong germination at a uniform rate, somewhat thinner in the row and then bring the rows slightly closer together to allow of more thorough cultivation. There are few soils in the corn belt where a stand averaging two stalks per hill in rows 3 feet 6 inches apart, properly cultivated, will not give greater yield of marketable corn than will one averaging 3 or 4 stalks per hill.

The proper cultivation of corn is a matter which is determined largely by the season and soil, but I wish to call attention to one or two of its most important features. The corn belt farmers are learning that a harrow used once, twice, or even more times, before the corn is large enough to cultivate readily, is the cheapest and most efficient form of early cultivation. The use of the harrow is, of course, determined largely by the season, but except on seasons of abundant early rainfall it is of great value in breaking the crust, in conserving moisture and in controlling the early growth of weeds.

Again, the farmers are learning that the old cultivation with two large shovels to the gang which throw a wide furrow and cut deep into the root-bearing layer of the soil is rarely so efficient as the more shallow working cultivator with three or even more shovels to the gang. Of course, on foul land or on certain compact soils this shallow cultivation is not satisfactory, but those cases are exceptions to the general rule.

The practice of cultivating after the corn is too large to cultivate with a two-horse or a two-row cultivator is receiving considerable attention. I know of crops that were saved by a one-horse shallow working cultivator where the drought was severe. This cultivation on dry seasons means tons of water saved for the use of the corn plant on every acre, and the increased yield is sufficient evidence of the use the crop makes of the water thus saved.

I cannot in this paper go into the matter of corn breeding as a factor in determining corn yields, but I wish to call attention to two or three important considerations regarding the seed. The experiment stations are coming more and more to appreciate the great importance of strong germinating corn. It has formerly been thought that if corn would germinate this was all that was necessary, but the strength of germination has been shown to be an important determining factor in corn yields. It is, of course, true that Texas farmers are not troubled to such a great extent as the farmers further north by the weakening effect of early freezes upon the germination of corn, but even there it is of importance. Corn not thoroughly dry before freezing weather is sure to be more or less weakened in germination, and no season in recent years has been so bad as the present one in this respect. The low vitality of the bulk of the seed corn of the northern half of the corn belt is causing great uneasiness among the corn growers. A wet fall, in which it was impossible to gather the corn early, followed by extremely cold weather, has been the cause.

Corn to grow strongly should be picked as soon as ripe and safely stored in a dry, airy place. This is essential to strong germination. It matters little how heavy the freezing after the corn is once dry, but freezing when it is still moist is very injurious. On most seasons it will, therefore, pay the careful farmer to pick his seed corn early before the crop is harvested, gathering it from the standing stalk. Such a method has other advantages, too, besides that of ensuring a strong germination. One is then able to see the stalk on which each ear is produced—a most important consideration. I am firmly of the opinion that the near future will bring sufficient knowledge regarding the character of the stalk as affecting the yield of corn, to enable us to tell more about the production from stalk character than from ear character. Even now enough is known to make it highly important that seed ears be picked from the field at a time when the stalk can be examined, rather than from the wagon bed or from the crib. Experiments have shown that this is an economic possibility. Moreover, the position of the ear on the stalk is a very important thing, and by field selection only those ears should be selected which come from stalks on which the ear is situated low down. Ears thus selected will transmit this character, thus tending to lower the average height of ear, which makes harvesting easier and lessens the danger of the corn blowing down.

Some results of the Missouri Experiment Station on the character of kernel as affecting the strength of germination and the resulting yield of corn are of interest. Selections have been made of ears having rather horny kernels as compared with those having very white, starchy kernels, and also of ears having large germs as compared with those having small germs, the strength of germination as well as the ultimate effect on yield being determined in the various cases.

The effect of the various types of kernels upon the strength of germination was determined in boxes of sand in the greenhouses. The results showed a very striking increase in vigor in favor of the medium horny kernels as compared with the starchy ones, and also in favor of the kernels with large germs as compared with those having small germs.

The yields resulting from the field planting of these various types of kernels are given in the following table:

EFFECT OF CHARACTER OF KERNEL ON YIELD OF CORN.

(Average of 6 plots of each.)

	Horny kernel.	Starchy kernel.	Large germ.	Small germ.
1907	68.7 bu.	56.9 bu.	69.5 bu.	58.7 bu.
1908	34.3 bu.	29.6 bu.	36.4 bu.	29.6 bu.
Average	51.5 bu.	43.2 bu.	52.9 bu.	44.1 bu.

RESULTS FROM BREEDING BLOCK.

	Horny kernel.	Starchy kernel.	Large germ.	Small germ.
1908	63.3 bu.	59.3 bu.	63.4 bu.	59.2 bu.
1909	54.9 bu.	51.5 bu.	55.0 bu.	52.2 bu.
Average	59.1 bu.	55.4 bu.	59.2 bu.	55.7 bu.
Average of all trials	55.3 bu.	49.3 bu.	56.0 bu.	49.9 bu.

These results show a striking increase in yield in favor of the more horny types of kernels and those with large germs. It must be remembered that the ears selected were all from the same variety of corn

(Boone County White), so that the results give very strong indications of the types of kernels which produce the largest yields. They indicate that very starchy ears are to be avoided, and also those with small germs.

This experiment indicates the character of the results that are being secured by the experiment stations in their investigations on the corn plant. There is a great deal yet to be learned, but these studies have gone far enough to indicate some of the more striking characters of high yielding ears. It cannot, of course, be said that there is any one best type of ear for all soils and all regions, nor even for all seasons, but such investigations are furnishing to the practical grower the knowledge that he needs in his work of selection. They are showing, too, that there is just as much need to know an ear of corn thoroughly and to study its type and character as there is to know the proper form and type of profitable farm animals. In other words, there is just as much in corn breeding as in animal breeding, and we shall never produce the highest yields of corn possible on our lands until this factor is given its proper attention.

The modern farmer who would produce maximum corn yields must master many problems. He must know his soil and the methods of maintaining its fertility. He must know the essentials in preparation of his land for a crop not for a single kind of season but for various sorts of seasons. He must know those methods of culture and of tillage which will give the plant the maximum of plant food and of moisture. He must know how to select and care for his seed corn—he must be a corn breeder. Not until these principles are mastered and put into practice by the farmers of the corn belt will the yield of this great cereal be worthy of the lands which nature has given us.

SOME FACTORS IN SUCCESSFUL WHEAT PRODUCTION.

(F. H. Demaree, Agricultural College, University of Missouri.)

At the present time when there is so much talk about corn, its improvement and production, a word about wheat will not be amiss.

Because of the comparatively large profit in the crop and the certainty of some return we have had for several years past an excess in the corn acreage which has resulted in a general reduction in yield and injury to the ground from continuous cropping. Perhaps because of the depredations of the chinch bug and Hessian fly a few years ago, our farmers largely lost interest in the wheat crop. Doubtless very few of them stopped to figure the cost of production of the two crops and the returns from each. From many figures the cost of producing an acre of corn is approximately $12 and that for wheat $8 per acre. This year (1909) the price of corn has averaged 58 cents per bushel and wheat $1.07. The average production of wheat last year was 13 bushels per acre and corn 28 bushels. At current prices the value per acre of wheat for the State was $13.91 and $16.24 for corn, leaving a profit for wheat of $5.91 per acre and $4.24 for corn. Still further we may pretty accurately figure that a 25-bushel crop of wheat at 80 cents per bushel, the current price for the last five years, will yield as large a net return as 55 bushels of corn at the average price of 45 cents per bushel.

Of course, the profitableness of any crop is largely dependent upon its yield. As we have seen, the average production of wheat last year was only 13 bushels per acre and corn 28 bushels per acre. Is there any means by which these yields may be increased? A glance at the records of any rotation experiment of any of our experiment stations will show that changing crops grown on the same land, in regular order, is one of the best means to increase the yield of crops. This systematic rotation is of benefit in many ways. It maintains a greater supply of humus in the soil, which makes that soil more easily worked, more capable of holding reserve moisture and of draining away surplus water. The presence of humus is also necessary to make plant food available, for by its decomposition nitrates are formed and the mineral plant food elements are dissolved by the organic acids formed.

Instead of our farmers contenting themselves with 28 bushels of corn per acre, they could more than double the crop if every one would practice a systematic rotation.

On the other hand, it is well to know that the yield of wheat need not be confined to 13 bushels per acre. This station has been conducting variety tests of wheat for many years past and has found many good producing varieties, several of which have averaged above 25 bushels per acre for the last five years.

Many questions are asked as to the relative merits of the different varieties and variety characteristics. As to white and red wheat, the Ohio station made 144 trials of white and 627 of red wheat. The white averaged 27.3 bushels per acre and the red 27.8 per acre. For yielding power, then, there is practically no difference between the two, but red wheat as a rule is harder than white and has a better quality of gluten and is generally conceded to make a better quality of flour.

It is well to note, however, that in most of this State the wheat is only semi-hard, and that hard wheats gradually get softer. In the extreme northern and northwestern part of the State this is not true, but it is true of the remainder of the State. As hard wheat turns softer there appears in it large numbers of yellow berries, which, when ground with the rest, give a yellow color to the flour that is very objectionable; consequently such wheat is always quoted lower on the market in this State than the softer red winter class.

The Ohio station also made 342 tests of bearded wheat, which averaged 25.9 bushels per acre, and 418 trials of beardless wheat, which gave 26.4 bushels per acre. Here again it is to be noted that there is not much difference in the yields. It has been noted, though, that beardless varieties do not have quite as great a tendency to lodge as bearded ones, but a greater tendency to rust. The bearded varieties generally have harder grains and weigh heavier than beardless ones. They also sprout more in the shock.

In some localities winter killing is also an important item to be considered in successful wheat growing. Just how a variety will stand the winter depends largely on its manner of growth. Certain varieties are characterized by a narrow, dark green, nearly purple colored leaf, which in the fall never grows high, but clings to the ground. Such varieties are uniformly hardy and in the main good yielders. Rudy, Nigger and Winter King are examples of such varieties. Most wheats, however, have a more upright habit of growth and are more susceptible to the old and freezing and thawing of an open winter and the early springs. Still, we have among these varieties many which have adapted themselves to our conditions and can be depended upon.

Taking all things into consideration, then, the successful production of wheat is in the first place dependent upon the variety grown. In making his selection every farmer must weigh his conditions, soil, climate, and the experience of his neighbors. For bottom lands the Valley, Egyptian, Nigger, and Rudy are well adapted. For uplands Mealy, Early Ripe, Fultz, Fulcaster, Michigan Amber, Mediterranean, Nigger, and Rudy are all good.

Another factor to be considered in wheat growing is the Hessian fly. This insect at one time nearly ruined the wheat industry, so that now our farmers say when we begin again to grow wheat how can this pest be controlled. In spite of the fact that they have been so troublesome, the fly can be pretty well controlled. There are two broods of them, a spring and a fall brood. The fall brood is migratory, and it is the one to be handled. The spring brood will hardly leave the field where hatched, so that if the eggs of the fall brood could be destroyed no farmer need be troubled by the fly in the spring. This can easily be done by sowing late or by sowing a narrow strip of two or three drill widths wide early—from August 1 to 15—along one side of the field. When this comes up all the flies for a great distance come in and lay their eggs. At the regular sowing time turn this strip of wheat under and roll down good, then sow the whole crop. The objection to late sowing is that the wheat does not get sufficient start to stand the winter as it should.

The wheat smuts, also, do considerable damage to this crop, but they can be largely controlled if one but takes the trouble. These smuts are of two kinds, loose smut or the common black head which appears in wheat, and stinking smut. The latter is not visible, but is found inside the grains of wheat, reducing the whole content to a mass of black spores, which is extremely objectionable for flour making. The spores are carried over in or on the kernels of wheat and can be closely controlled by the formalin treatment. Immerse the seed wheat, after fanning well, in a barrel containing a solution of formalin made by adding 1 pound of formalin to 40 gallons of water. Skim off the grains that float, as they are infected with the stinking smut. Spread the good wheat on the floor to dry, and the whole treatment has been accomplished.

Perhaps the greatest factor causing poor crops of wheat is lack of preparation of the soil. Wheat ground should be plowed early if wheat follows oats, in order that the connection between the subsoil and the soil turned over may be resumed. It is not necessary to plow more than four or five inches deep for wheat because it is a shallow rooted crop. The main thing is to get the soil packed down and then a good fine seedbed worked on top. The roller should be used freely on wheat land. The writer has seen this spring many fields of wheat poorly plowed, huge clods showing and a poor stand of wheat nearly dead. What was the matter? In the first place, the wheat did not germinate well among the clods because wheat kernels are small and cannot get moisture for germination but from fine dirt. In the second place, the land was not compact and consequently the remaining wheat was being heaved out and killed by the freezes and thaws.

We may, then, sum up the whole situation by saying that the wheat crop has been neglected for the sake of corn and bad results are following to both crops. It is important to rotate crops for the sake of the productiveness of the soil. Study conditions and test out several varieties, then grow the best one. The fly can be largely controlled by sowing a "fly trap"; the smut can be killed in seed wheat with the formalin treatment; and, above all, better preparation of the wheat land can be practiced.

PASTURES FOR HOGS.

(F. G. King, former Live Stock Assistant, Missouri State Board of Agriculture.)

SUMMARY.

Bluegrass is very generally used for a hog pasture in this State, and especially in the northern and central sections. Its popularity is due to its hardiness and the fact that a pasture of this grass is very seldom killed by pasturing. It comes early in spring and lasts until late in the fall, and will, if not heavily pastured in fall, furnish very good winter pasture. It, however, has to be supplemented with some other pasture during the hot weather of summer. White clover also grows well with bluegrass, thus adding to its value as a pasture grass for hogs.

Timothy is not as generally used as bluegrass for a hog pasture. It does not come as early in spring nor does it stay as late in the fall. White clover does not spring up in timothy pasture like in bluegrass. If cut early, timothy does not have as long a resting period in summer as bluegrass, but if cut early enough to keep from getting too woody for good pasture is comparatively short-lived.

When on a bluegrass or timothy pasture young hogs do not receive the proper food nutrients to properly balance a ration of corn alone. For hogs under six months of age, to give the best returns on a pasture of this kind, they should receive in addition to their corn a limited amount of some kind of nitrogenous feed, such as shorts, linseed oilmeal, tankage, meatmeal, etc. Hogs more than six months old make less rapid gains when fed corn alone than when fed corn and a supplement, in connection with bluegrass or timothy, but the gains made from the former ration are usually as cheap as from the latter.

Clover is the most generally used hog pasture in the State. It furnishes the food nutrients lacking in corn, and fits well into a rotation where corn is the principal crop. It is killed by too heavy pasturing, and is also often winter-killed. It makes the best pas-

ture for hogs when heading or blooming. If allowed to ripen it becomes woody, and is not relished by hogs, and needs cutting in order to make a new growth.

Alfalfa furnishes a forage fully the equal of that furnished by clover, and in greater quantities. It cannot be pastured very close without injury, but should be allowed to make about two crops of hay each season.

Hogs on clover or alfalfa pasture will sometimes make a satisfactory gain with no grain feed, but it usually takes a small feed of grain to secure the best results. After the pigs have started well after weaning time, a ration of corn alone in connection with clover or alfalfa pasture usually gives the most profitable gains. The rapidity of gains made on corn alone can be increased by adding a small amount of shorts, linseed oilmeal, tankage, etc., to the corn, but the cost of gains, with feed at present prices, will be little affected.

Cowpeas are the cheapest form of home-grown protein to use for feeding with corn. They can be sown either alone or with corn and pastured with hogs. Hogs can be made to gain two or more pounds daily per head with a ration of corn, fed on cowpeas pasture.

Rape is very valuable for furnishing forage at times when clover or other pasture is short or has been badly injured. It can be sown to furnish pasture at almost any time during the growing season. The pasture is of about the same value as clover. Practically the same grain ration used in connection with clover pasture will give the best results on rape.

Oats, or a mixture of rape and oats, make an excellent early summer pasture. They should be pastured from the time they are three to six inches high until heads begin forming and again when the seed is in the dough. When on oats pasture, hogs should be fed some kind of nitrogenous supplement with corn, but not in such large quantities as when they are on bluegrass or timothy pasture.

Sorghum makes a good pasture during drouths and hot weather, but is not relished by hogs as much as other pastures. It is best pasture when about one and one-half to two feet high. It can also be used when heading. Hogs on sorghum also require some supplement with corn.

Pumpkins help to put the hog in good physical condition for a heavy feeding period. They are easily and cheaply grown, and add very greatly to the value of a ration of corn.

Soybeans have not become well established in this State, but have proven very successful in neighboring states. They furnish more grain per acre than cowpeas, hence are more valuable as a hog feed, where they can be grown successfully, than the latter.

Artichokes furnish a succulent feed for fall and early winter. They are not injured very much by freezing, and can be pastured at any time during the winter when the ground is not frozen. For keeping the hog healthly and in good condition physically, they are very valuable.

Pigs or shoats on a good winter pasture will be in much better health and will make faster and cheaper gains than when no pasture is furnished.

Rye and wheat furnish the best winter pasture for hogs. Bluegrass, if not pastured too heavily in the fall, also makes a good winter pasture. Rye should be sown in August and September in order to give the best pasture. Wheat usually makes better fall pasture, but is not as good for spring pasture as rye.

A good pasture for hogs can easily be provided by using temporary and quick-growing crops, such as rape, oats, cowpeas, etc. These crops should be planted in different fields, and one pastured while another is growing. The inconvenience of clover dying can be overcome by proper use of quick-growing crops.

INTRODUCTORY.

The hog, in his natural state, was not an exclusive grain eater; plant and animal life in any form was made use of as food for this wild beast. But as he became domesticated the hog was deprived of the opportunity to search for and choose his own food, and had to be content with whatever was given him. So easily fattened and so uncomplaining is the hog that he came to be regarded as purely a grain-eating animal. Until within the last few years, the hog would, with cheap feed, return a profit when fed grain alone on an unsuitable pasture, or possibly no pasture at all. With feeds at the price they have been for the last few years, the man who feeds in a dry lot, after the old style of fattening, is engaging in a very doubtful investment, to say the least. Dean H. J. Waters of the Missouri Agricultural College says: "Perhaps the largest single waste occurring on the Missouri farm at the present time is that which comes from the too exclusive use of corn in growing and fattening hogs. The cheapest and most easily applied remedy is a more general use of the proper forage plants in summer and the use of some home-grown protein in winter. It is not, of course, to be denied that the hog is primarily a grain-consuming animal; at the same time forage plays an important role in economical hog production, and deserves far more attention than it has yet received."

For the purpose of obtaining information as to the best forage crops used as hog pasture in this State, a list of questions was addressed to about eight hundred representative hog growers of this State. This list of questions included the following:

What kind of pasture do you provide for your brood sows and spring pigs?
How many months do you provide pasture for hogs?
How do you feed spring pigs in connection with your pasture, before weaning? After weaning?
What daily gains do you make on them, before weaning? After weaning?
What pasture, if any, do you provide for fall pigs in winter?
What pasture, if any, do you provide for fall pigs the following summer?
What do you feed fall pigs the following summer?
How do you prepare this feed?
Will hogs make a satisfactory gain on pasture alone? If so, on what kind of pasture will they do this?
How many fall pigs can you pasture to the acre?
What pasture do you provide for breeding stock, in winter? In summer?
When is the best time to turn hogs into pasture in order to get the greatest benefit from it?
What, in your opinion, is the most profitable forage crop to grow for hogs?

In reply to this list of questions, 204 replies were received. It is fair to assume that an average lot of farmers were represented in these reports. As a well established practice among the best farmers is usually correct, this list of replies may be regarded as representing the best practices to follow in regard to pastures.

KINDS OF PASTURE TO USE.

Pasture for Spring Pigs and Brood Sows.—In reply to the question, "What kind of pasture do you provide for your brood sows and spring pigs?" seventy-nine out of one hundred three farmers in the northern half and thirty-seven out of seventy-six in the southern half of the State mentioned bluegrass either by itself or in connection with some other forage. This pasture, of course, is in most cases supplemented by white clover in its season, which springs up in permanent pastures in almost all parts of the State. In fact, twenty-one correspondents in the northern half and eight in the southern half of the State mentioned this kind of clover in connection with the bluegrass. Twenty-nine correspondents in the northern and nine in the southern parts of the State use "red clover," while the replies included the term "clover" in forty-two instances in northern Missouri and fifty-four instances in southern Missouri, thus making a total of ninety-two out of one hundred three replies from the northern and seventy-one out of seventy-six in the southern half of the State that included clover in some form.

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*As a bulletin is being prepared on the care of the brood sow and her litter, the feeding of pigs before weaning time and pasture for the brood sow has not been discussed in this publication.

While these two kinds of plants furnished by far the greater amount of pasture used, several other kinds were mentioned that may serve as a regular pasture, or to fill up a gap between regular periods of pasturing permanent crops. For convenience the State was divided into the northern and southern halves and the replies tabulated according to this division. The following table shows the kind of pasture preferred in the two sections of the State:

	Northern half.		Southern half.	
	Replies received.	Percent.	Replies received.	Percent.
Total replies received	103	....	76	....
Bluegrass	79	76.7	37	48.7
Red clover	29	....	9	....
White clover	21	....	8	....
Clover (variety not mentioned)	42	....	54	....
Total clovers	92	89.3	71	93.4
Timothy	16	15.5	7	9.2
Rye	12	11.7	1	1.3
Rape	7	6.8	7	9.2
Wheat	5	4.9	2	2.6
Cowpeas	3	2.9	7	9.2
Oats	2	2.0	4	5.3
Alfalfa	3	2.9	3	3.9
Sorghum	2	2.0	2	2.6
Redtop	1	1.0	1	1.3
Orchard grass	0	....	2	2.6
Japanese clover	0	....	1	1.3

Based on the assumption that the practical hog raiser is usually right, the replies tabulated above indicate that for spring pigs and brood sows, bluegrass, bluegrass and clover, or clover alone furnish the best and most convenient pasture for the average farm conditions. Practically the only other crops that will furnish pasture the entire season are timothy, alfalfa and possibly rape, the others mentioned being used as temporary pasture to fill a gap in the permanent pasture.

The relative value of clover, alfalfa and bluegrass as a pasture for spring pigs is shown by a trial reported by Dean Waters in Bulletin 79 of the Missouri Experiment Station. The pigs used were spring pigs, weighing at the time the trial was to begin—July 25—about fifty pounds each. The trial lasted for 102 days—from

July 25 to November 4. The forage was supplied in pens instead of pasturing it in the field. All lots were fed corn meal in addition to forage:

	Weight at beginning.	Weight at end.	Gain.	Daily gain.	Grain per lb. gain.
Alfalfa	47.2	132.2	85	.83	4.01
Clover	49.2	127.7	78.5	.77	4.35
Bluegrass	45.2	109.7	64.5	.63	5.31

This data shows that the daily gains are increased 22.2 per cent. by using clover and 31.7 per cent. by alfalfa instead of blue grass as forage for pigs. For the same reason the gains were made on 18.1 per cent. and 24.5 per cent. less grain, respectively, than with bluegrass forage. This one trial is so nearly in accord with general observation and experience among farmers that further data on the subject is not necessary. Very few men have failed to observe the advantage to be obtained from furnishing some kind of leguminous forage, such as clover, alfalfa or cowpeas, in connection with a bluegrass pasture.

Figure 1. Fattened on corn, clover and bluegrass.

Since bluegrass and white clover are used very extensively as a hog pasture, especially in north Missouri, there must be some valuable qualities possessed by this grass. Bluegrass is permanent, and after once forming a sod on pasture is very seldom killed out except by being plowed up. It also comes in early in spring and furnishes good early pasture which, with the exception of about two months in midsummer, lasts until late fall, thus causing little inconvenience in providing some kind of pasture. It can be pastured as close as desired without any permanent injury and without fear of its being killed. White clover also springs up in bluegrass and furnishes a legume to supplement the bluegrass, thus making excellent pasture. However, in spite of its many good qualities, bluegrass, unless in connection with some kind of clover, does not make the best kind of pasture for spring pigs.

Clover, which forms a part of almost all the hog pasture of the State, furnishes, as is shown by the trial given above, one of the very best forages for hogs that can be grown. It, however, has one great disadvantage not possessed by bluegrass, in that it has to be resown every two years, and is much more easily winter killed, and also is more easily killed by heavy pasturing. But a good clover field is as good pasture as can be found and with judicious use of catch crops, a succulent forage with clover as a basis can be provided for hogs the entire season.

Only four of our correspondents mention anything other than clover, alfalfa or bluegrass, or some mixture of the three, as their principal forage crop for hogs. These four use some rotation of wheat, rye and oats, followed by sorghum or rape, and then cowpeas or rape, and one man mentions cheat and Japanese clover. These crops mentioned above are excellent for a short grazing period, but are too short-lived to be relied on unless a systematic plan is followed whereby one field is growing while another is being pastured. They occupy, nevertheless, a very important place in a hog farm by supplying good pasture while permanent pasture is short.

Summer Pasture for Fall Pigs.—The question, "What pasture do you provide for fall pigs the following summer?" brings out the fact that bluegrass is not depended upon for summer pasture for fall pigs to nearly the same extent as for spring pigs, but that the clovers are used to almost the same extent, showing that the clovers are not mixed with bluegrass as much for fall as for spring pig pasture. The replies were as follows, the table showing the replies that mentioned the following grasses alone or in connection with some other grass:

	Northern half.		Southern half.	
	Replies received.	Percent.	Replies received.	Percent.
Total received	75	....	56	....
Bluegrass	47	62.7	19	33.6
Red clover	6	....	2	....
White clover	9	....	5	....
Clover (variety not mentioned)	51	....	41	....
Total clovers	66	88.0	48	85.7
Timothy	9	12.0	5	8.9
Oats	5	6.7	2	3.6
Rape	5	6.7	3	5.4
Alfalfa	4	5.2	3	5.4
Rye	1	1.3	1	1.8
Sorghum	1	1.3	3	5.4
Cowpeas	1	1.3	6	10.7
Redtop	1	1.3	3	5.4

This report varies little in substance other than that mentioned above, both showing that clover or a mixture of clover and blue grass forms a great majority of the hog pastures, supplemented by temporary crops to supply forage while the regular pastures are short. A small per cent. of the permanent pasture is timothy, but the great majority is clover or clover and blue grass. The most popular temporary pasture in the northern half of the State is either oats or rape, or a mixture of the two. Either oats or rape will make an early pasture, and rape can be sown to be ready for pasture at almost any time of year. In the southern part of the State, cowpeas, sorghum and rape furnish the best temporary or catch crop. Rape and sorghum furnish spring and summer pasture, while rape and cowpeas furnish late summer and fall pasture.

The popularity of quick-growing legumes for pasture are shown by the question upon the most profitable crop to grow for hogs.

Best Forage Crop for Hogs.—In reply to the question, "What do you consider the most profitable forage crop to grow for hogs?" the farmers brought out very distinctly the high regard in which legumes are held in this State. Of 159 replies, 114 gave either clover, alfalfa or cowpeas as the most profitable forage, and twenty-one other replies mentioned one of the three in connection with some other crop, leaving only twenty-four stockmen preferring nonleguminous crops. Of these twenty-four, twelve preferred rape alone and three others rape in connection with some other crop. The preferences for these four crops are shown by the number of farmers preferring each crop, which were as follows:

	Northern half.	Southern half.
Clover	39	38
Alfalfa	11	6
Cowpeas	1	16
Rape	4	8

The other crops considered the best forage for hogs in the northern part of the State were: Blue grass and clover, 6; pumpkins and corn, 2; and one each of rutabagas and turnips, sorghum and cowpeas, rape and rye, rye for fall and spring, clover, timothy and blue grass, clover and wheat, rape and oats, rye and clover, clover and sorghum, clover and cowpeas, cowpeas and corn, oats and rye, clover and timothy, and oats. In the southern half of the State, the forage considered best aside from the clover, alfalfa, cowpeas, and rape, were: Blue grass and clover, 4; rye in winter, 2; and one each of the following: Cowpeas and clover, rye and cowpeas, oats and kale, sorghum, cowpeas and oats, sorghum at heading time and rape, blue grass, and wheat, rye and cowpeas.

PASTURING BLUE GRASS AND TIMOTHY.

Blue grass, in conjunction with white clover, and in some cases red clover, is a pasture that, as was shown by the table of the preferences of hog raisers for pasture, is found on practically every farm in central and north Missouri. Its popularity rests on its hardiness, and the fact that it is a perennial, and once established, is hard to kill out, and also makes excellent pastures. Neither is there the danger of scouring among hogs on blue grass pasture that there is in some other kinds, such as young clover or alfalfa. Blue grass also comes early in spring and furnishes good fall and fair winter pasture. It should be pastured heavily enough to prevent any extra growth, because blue grass that has become rank and growthy gets woody, and when in this condition is not a satisfactory pasture for hogs. Most of our correspondents turn on blue grass when it is young and tender. There is a period of from two to three months during the summer just after seeding, when blue grass is in its resting stage and is too dry and woody to give good hog pasture, and has to be supplemented with some other crop, such as clover, sorghum, rape, etc., that can be sown in spring and be ready for pasture by July. The resting period of blue grass, coming at the time of year when the hot weather makes a green pasture all the more necessary for success in hog raising, is one of the most objectionable features about blue grass as a pasture for hogs, and every farmer should prepare for this resting period of blue grass by providing some other kind of pasture.

The value of timothy as a pasture is hardly as great as that of blue grass, for the reason that blue grass is suitable for pasture much earlier in the spring and will last much longer in the fall, and also contains white clover, which is seldom found in timothy. The timothy, however, does not get as tough as the blue grass and will spring up sooner after being cut, thus shortening the period of rest in midsummer. Timothy, however, when it begins to joint, gets woody unless cut when very green, and when managed in this way is not long-lived.

Fig. 2. THE SPIRIT THAT MAKES HOG-RAISING A SUCCESS.

Feeding Spring Pigs on Blue Grass and Timothy.—The feeding value of the two grasses as pasture are so near the same that the best method of feeding on one kind will apply equally well to the other kind of pasture. Both timothy and blue grass are lacking in protein, which goes to form muscle and bone. Clover, however, is well supplied with this material, and when mixed with timothy or blue grass, makes a well-balanced pasture. Corn, which is also lacking in protein, does not make the best feed for hogs on a pasture consisting wholly of timothy or blue grass. Clover in the pasture, however, furnishes the necessary nutrients for growing stock. This is shown by the fact that when clover or alfalfa was made the principal pasture 36.5 per cent. of our correspondents feed corn alone to spring shoats on pasture, while of those who used timothy or blue grass even when mixed to a greater or less extent with red or white clover, only 28.9 per cent. feed corn alone. When there is not enough clover in a pasture to furnish a large proportion of the forage, there is a need, especially with shoats, for a feed consisting of more than corn alone. The amount of clover available determines to a large extent the needs for these supplemental feeds. This is shown very clearly in an experiment, conducted at the Iowa Experiment Station, with the hogs running on timothy pasture and fed corn and supplemental feeds, and another lot on clover pasture and fed corn alone. The summary of the experiment is given below:

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112 days, 10 pigs per lot.

Pasture.	Grain ration.	Weight at beginning.	Gain, per pig.	Daily gain.	Grain per lb. gain.	Grain daily per pig.
Timothy......	Corn...............	59.9	103.4	0.923	451.4	4.17
Timothy......	Corn 2, shorts 1.....	59.8	125.5	1.120	409.9	4.59
Timothy......	Corn 1, shorts 1.....	59.8	133.2	1.180	398.0	4.74
Timothy......	Corn 5, meat meal 1..	60.1	138.5	1.237	409.6	5.07
Timothy......	Corn 5, tankage 1....	60.1	153.9	1.374	398.4	5.48
Clover........	Corn...............	59.9	133.7	1.193	416.1	4.97

It will be noted that the gains made on clover pasture and corn were faster than those made on timothy pasture and corn and shorts, but not as fast as those on timothy pasture and fed corn and tankage or corn and meat meal. Based on this data, corn alone fed on a clover pasture is equal to a ration of one-half corn, one-half shorts on timothy pasture, and superior to a ration two-thirds corn, one-third shorts on the same kind of pasture. The value of feeding some grain containing an excess of protein, to hogs on timothy pasture, is shown by the more rapid and more economical gains made by the pigs fed corn and shorts and corn and meat meal or tankage. The rate of gain was increased 30 to 50 per cent. by using a meat by-product, and from 12 to 20 per cent. by using shorts with corn.

The above results are borne out by the practice of the farmers as shown by the reports of those using blue grass or timothy with more or less clover as a pasture for pigs after weaning time, and their method of feeding is shown by their answers to the question, "How do you feed your spring pigs on pasture after weaning?'' Replying to this question, the eighty-three who use blue grass or timothy as their principal pasture, answered as follows:

	No. of replies.	Percent of whole.
Corn alone	24	28.9
Middlings, shorts or shipstuff	28	33.7
Oilmeal	11	13.3
Tankage or meat meal	7	8.4
Bran	6	7.2
Milk	19	22.9
Rye, wheat or oats	4	4.8
Oats	2	2.4
Wheat	1	1.2
Rye	1	1.2

These replies show that when the corn is supplemented by a more nitrogenous feed, the preference is for some wheat by-product, 33.7 per cent. using shorts, middlings, or shipstuffs and 7.2 per cent. bran; 22.9 per cent. feed milk, while 13.3 per cent. feed linseed oil meal, and 8.4 per cent., either tankage or meat meal, and a smaller per cent. some mixture of oats, rye or wheat. These figures refer to the time just following weaning when the pig is being started to growing well after being weaned. As the shoat gets larger, it is common practice to increase the amount of corn, and in most cases to decrease the amount of slop or stop feeding it altogether. While in general it gives faster gains to feed a supplement to corn, a pig that has received a ration containing sufficient bone and muscle-forming food until six months old, will do very well until ready for market on corn alone. Until a pig is six months old, however, unless on a good clover, alfalfa, cowpea or rape pasture, in order to get best results should receive something besides straight corn.

The amount of feed to be given varies with the purpose of the feeder, as to whether the pig is intended for market at six to seven months of age, or at eight to ten months, or older. This fact is true, however, that pigs can be made so fat before they have reached a weight at which it is profitable to sell them, that they will not make a satisfactory gain. On the other hand, too little feed, especially on timothy or blue grass pasture, leaves the pig somewhat stunted and inflicts a permanent injury. The gist of the information as to the amount of grain to feed, learned from our correspondents, is to keep the pigs in good growing condition, but not excessively fat until time to put on full feed for market. Many of our correspondents feed the pigs rather heavily from the start, and have them ready for market at six to seven months of age, while others just keep them growing well until six or seven months old, and then full feed for a few months. The merits of the two systems are discussed under the paragraph on the amount of grain to feed on clover or alfalfa pasture.

Feeding Fall Pigs on Blue Grass and Timothy Pasture.—As blue grass or timothy without clover was used as summer pasture for fall pigs by only eight out of one hundred thirty-one correspondents, the discussion of finishing hogs on blue grass is not of nearly so much importance as the feeding of stockers. But if a hog has received a good growing ration for five or six months, the finishing can be done very well on corn and pasture. Of the eight men who report using blue grass as the sole pasture for fall pigs, five also report feeding corn alone, one corn and milk, one corn and shorts, and one does not state the kind of feed used. This small number of reports is not enough to establish a practice, but a trial at the Missouri Experiment Station will be of value in this connection to show the effect of the ration fed on blue grass pasture. Professor Willson found that hogs that had followed cattle until they had reached the weight of 193 pounds each, gave the following results when fed for 46 days on a blue grass pasture:

Ration.	Daily gain.	Grain per per lb. gain.	Daily grain eaten.
Shelled corn	1.76	5.49	8.85
Shelled corn 6 parts, linseed oilmeal 1 part	2.00	5.10	9.09
Shelled corn 8 parts, tankage 1 part	2.01	4.93	9.08

This experiment shows a faster gain when linseed oil meal or tankage is fed with corn, and also a gain on smaller amount of feed; but the cost of gains with corn at 60 cents per bushel, linseed oil meal at $36 per ton, and tankage at $44 per ton is: $5.88 per 100 pounds gain when fed corn alone, $5.97 when fed corn and linseed oil meal, and $5.93 when fed corn and tankage, thus showing that except for more rapid gains, the addition of a supplement to corn to large hogs on grass will not return a profit on the investment. The value of rapid gains, however, is sometimes very great, due to getting them ready for market sooner and avoiding possible loss from disease.

PASTURING CLOVER OR ALFALFA.

Clover is the great hog pasture for Missouri. It furnishes an abundance of excellent pasture that supplies the necessary nutrients lacking in corn; it fertilizes the ground while growing; and it fits perfectly into a rotation where corn is the principal crop. Out of 78 replies from the northern half of the State, as to the best forage crops for hogs, 39 gave clover first place, and 12 more gave clover in connection with some other crop, as the best forage, showing that 51 out of 78 of our correspondents in the northern half of the State, consider that it takes clover or a mixture of clover to make the best hog pasture. The 81 replies from the southern half of the State, give clover first place in 38 instances, and clover in connection with other crops in five more, making clover a part of the best hog pasture in 43 out of 81 cases. The general distribution and popularity of clover as a forage crop is due to its general adaptability to the conditions found in this State; there is no serious drawback to it as a hog pasture. It is, however, in addition to being a biennial, more easily killed by heavy pasturing than is blue grass or timothy. If heavily pastured when small, the hogs eat off the crown and kill the plant, or too heavy pasturing at any season of the year may cause serious injury. If the clover is to be pastured heavily, the hogs should not be turned in until the clover is several inches high. Clover is at its best for hog pasture when heading and blossoming, but if the hogs are not turned in until the clover reaches this state it will take a very large number to keep the pasture from getting too ripe. After the heads are ripe the plant is so woody that the hogs do not relish it as pasture. When the plant is in this stage it should be cut or clipped and a new and succulent growth allowed to spring up. The clover can be pastured heavily enough to keep the pasture from getting woody, but when pastured this heavily, a short dry spell is liable to cause it to die. Alsike clover is better in some regions than red clover, especially in low, moist

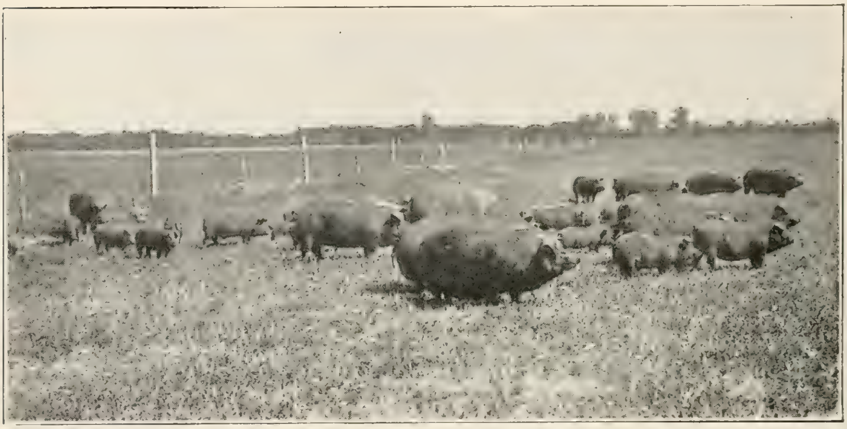

Fig. 3. ALFALFA FURNISHES MORE PASTURE THAN RED CLOVER.

ground. It will supply about as much pasture as red clover, is sown at the same time and furnishes pasture for about the same period. It is used rather extensively in the lower grounds of Northwest Missouri, where it seems to be especially well adapted.

Alfalfa is shown by the experience of its users to be somewhat superior to red clover as a hog pasture, both as to quality and amount of feed furnished. While an acre of clover will pasture from 8 to 12 hogs averaging 75-125 pounds per head, the same area of alfalfa will pasture 15 to 20 head of the same kind of shoats. Although alfalfa is just beginning to be recognized in this State, 10.7 per cent. of our correspondents say that alfalfa is the best forage crop that can be grown for hogs. Those who make these statements are not confined to any particular section, but are well distributed over the entire State. The value of this crop as a hog pasture has long been recognized in Kansas and Nebraska, where the alfalfa-growing industry is much older than in Missouri, and its value is now being recognized in this State. Alfalfa comes earlier in the spring than clover, and if kept from heading, will make a green succulent nitrogenous forage from spring until heavy freezing comes in the fall. Not only does this plant give a good forage during the growing season, but the hay, especially the last cutting, will furnish a high class roughage for hogs in winter and anyone who has used alfalfa hay for this purpose never fails to recommend it very highly.

The same precautions should be taken when pasturing alfalfa as when pasturing clover; i. e., the hogs should not be turned on before the pasture is well started, should not be pastured while the land is wet, nor so heavily that the plant does not grow well, and should not be allowed to grow large enough to get woody. If the purpose is to use the alfalfa solely for pasture, the field should be divided and one part pastured while the other is growing. The common practice, however, is to allow enough pasture so that about two crops or more of hay are harvested each year while the hogs are using it for pasture. By cutting the parts of the field a few days apart, one part is furnishing pasture while the other is being cut for hay. In this way pasture is furnished for a very large part of the year.

Feeding Spring Pigs on Clover or Alfalfa Pasture.—The composition of clover and alfalfa, and the character of the forage furnished by pasturing the two, are so nearly the same that the best methods of feeding for one will apply equally well for the other. As neither alfalfa nor clover seed can form any considerable part of the ration, the feeding value of the pasture rests on the forage alone. Since both plants furnish an abundance of protein for the growing hog, and corn is the great fat-producing food, corn, alfalfa, clover and hogs are fitted by nature to be closely associated.

For spring shoats on grass after weaning, the correspondents that use corn alone were in much higher percentage than those using corn alone on blue grass or timothy. This practical experience is strengthened by the feeding data given under the discussion on blue grass and timothy, when it was shown that corn alone on clover pasture has about the same value as corn and middlings or shorts on blue grass or timothy pasture. The number and percentage of correspondents that use the different kinds of supplements to corn for shoats on alfalfa or clover pasture, are as follows:

	Number correspondents using each different kind of feed.	Percent of whole.
Total	63	....
Corn alone	23	36.5
Middlings	17	27.0
Oilmeal	2	3.2
Tankage or meat meal	1	1.6
Bran	12	19.
Milk	13	20.6
Oats	1	1.6
Wheat	1	1.6

From the remarks made by our correspondents, we learn that as the pigs get older, the supplements to the corn are gradually decreased until, in a large majority of the cases, only corn is fed to the shoats on this kind of pasture. The inability of a two or three months old pig to give the best gains on forage and corn alone is shown by the fact that 63.5 per cent. of our correspondents prefer to feed some kind of supplement to corn to pigs of this age. But as the hog gets larger, he is better able to consume forage and does not need such a well-balanced grain ration.

Amount of Grain to Feed Pigs on Clover or Alfalfa.—The amount of grain to be fed on clover or alfalfa pasture varies, of course, from no grain at all to a full feed, according to the time the hogs are intended for market. Of the 153 replies to the question as to whether hogs will make a satisfactory gain on pasture alone, 121 replied in the negative and 32 in the affirmative. Of the 32 men who got satisfactory gains without grain, 16 use clover alone, 2 alfalfa, 3 clover and alfalfa, while 6 more use clover in connection with other crops, and 2 do not designate the kind of pasture. Three of the 16 replies mentioning clover alone, state it is used only when in bloom, and the others do not state the condition of the pasture. It is safe to say that the experience has been sufficient to warrant the statement that clover in bloom, or alfalfa, will, under favorable circumstances, make a fairly reasonable gain on grown hogs in thin flesh without grain. It is common practice among our correspondents, who intend to keep the hogs in good growing condition only, to feed an ear or two of corn daily; while the ones that "push" the hogs from weaning time can full feed without the danger of too early fattening that there is on the pastures where grain has to be depended on to make the greater proportion of the gain. An excellent comparison between the different amounts of corn to feed to shoats on alfalfa pasture was made by the Nebraska Experiment Station with corn alone fed to shoats on alfalfa pasture.

The results of an experiment lasting 63 days with 10 pigs weighing about 75 pounds per head in each lot, are shown below:

Ration.	Daily grain per pig.	Total gain per pig.	Average daily gain.	Grain per 100 lbs. gain.
No grain	....	1.4	.02	....
Light feed	1.33	21.7	.34	386
Medium feed	2.48	39.8	.63	398
Heavy feed	3.46	53.7	.85	423

These results show that with 75-pound pigs a feed of corn is necessary to get satisfactory gains. With no grain, the pigs little more than held their weight; with 1.33 pounds, or about two ears of corn daily, a gain of .34 pounds daily was made; with 2.48 pounds, or between 3 and 4 ears of corn daily, a gain of .63 pounds daily per pig was made; while with 3.46 pounds, or between 5 and 6 ears of corn daily, a gain of .85 pounds daily was made. It will be noted, however, that as the amount of grain fed daily was increased, the grain required to make a pound of gain was also increased. Another trial was made at the same station,* under the same conditions, but with different amounts of grain. These lots, consisting of 17 52-pound pigs, were fed ½ pound, 1½ pounds, and 2½ pounds of corn, respectively, per 100 pounds of live weight, and allowed to run on alfalfa pasture for 98 days, with the following results:

Ration.	Gain.	Daily gain.	Grain per 100 lbs. gain.
½ lb. corn per 100 lbs. weight	27	.28	124
1½ lbs. corn per 100 lbs. weight	36	.37	222
2½ lbs. corn per 100 lbs. weight	48	.51	332

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*From October 20 to November 10, the hogs were being changed from summer to winter quarters. During this period they made gains varying from 6 to 30 lbs. per head.

The similarity of the results of these two experiments indicate that they are reliable in showing that the smaller amounts of grain make cheaper gains, but that the heavier amounts of grain show faster gains, and are therefore getting the pigs fatter and nearer ready for market, because the light ration does little more than keep up a good growth without fattening, while the heavier ration lays on a good proportion of fat.

Time Required to Finish These Light and Heavy Fed Hogs.—The relative time to finish hogs that have been fed light and heavy rations, such as have just been discussed, is shown by a trial made at the Nebraska Experiment Station,[†] where 90 pigs, weighing 42.4 pounds each, were divided into three lots of 30 hogs each and pastured from June 23 to October 20 (119 days), on alfalfa pasture and fed dry shelled corn as follows:

Lot 1—1 pound corn daily per 100 pounds live weight.
Lot 2—2 pounds corn daily per 100 pounds live weight.
Lot 3—3½ pounds corn daily per 100 pounds live weight.

A summary of the first 119 days on pasture with a limited grain ration is as follows:

Lot.	Grain per 100 lbs. live weight.	Gain per pig.	Daily gain.	Grain per 100 lbs. gain.
1	1 lb.	57.3	.50	132
2	2 lbs.	75.1	.65	220
3	3½ lbs.	125.8	1.08	330

The results are so nearly a repetition for the two other trials given on this subject, that comment is unnecessary except to note the comparative cheapness of gain of the light fed lot and the comparatively rapid gains of the heaviest fed lot.

After the first 119 days on pasture with the above limited grain rations, they were full fed in a dry lot on a ration of ½ corn, ½ rye, soaked, and alfalfa hay until ready for market, each lot being disposed of as soon as finished. The finishing period beginning November 10th, and lasting until each lot of hogs was finished, gave the following results:

Lot.	Weight at beginning.	Weight at end.	Gain per pig.	Daily gain.	Grain per 100 lbs. gain.	Days to finish.
1	108	233	125	1.34	467	93
2	130	236	106	1.26	509	84
3	205	228	23	.80	787	29

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[*] Nebraska Bul. 99.

These figures show how nearly finished was the lot heavy fed on pasture in comparison with the light fed ones; also, the influence of the condition of the hogs upon the rapidity and economy of gain, and how the cost of gain increases as the end of the finishing period is approached, and how the high condition influences the cost of gain. The hogs of each lot were equal in every way except that one lot was fatter than the other at the beginning of this period of the experiment. The thin hogs made the more rapid and economical gain, but, of course, it required a much longer time to become far enough advanced for market.

Lot 3, which was almost finished when put on the last period, required 787 pounds of grain per 100 pounds of gain, but required only 29 days to finish. Lot 1, which was rather thin, but of the same age, made a gain of 125 pounds per pig, and required 467 pounds of grain for every one hundred pounds of gain made, and required 93 days to reach a condition similar to lot 3 after 29 days of feeding.

Combining both periods of the experiment into one period, extending from June 23rd until the hogs were finished, the results are as follows:

Lot.	Days on trial.	Weight at beginning.	Weight at end.	Gain per pig.	Daily gain.	Grain per 100 lbs. gain.	Pigs per lot.	Grain to fatten a pig from weaning time.
1 Light fed.......	230	42	233	191	.83	377	30	12.86 bu.
2 Medium fed.....	221	42	236	194	.87	391	30	13.54 bu.
3 Heavy fed......	165	42	228	186	1.13	395	30	12.80 bu.

Note that when the pigs were fed 1 pound of corn per 100 pounds weight for 119 days, and then full fed, it required 230 days to get ready for market; whereas, the pigs of the lot fed 2 pounds of corn daily per 100 pounds live weight for 119 days, and then full fed, required 221 days; and the pigs which were fed 3½ pounds of corn daily per 100 pounds live weight for 119 days and then full fed, were ready for market in a total of 165 days, or 5½ months from the time they weighed 42 pounds. This is finishing the pig at seven months old, weighing about 225 pounds.

It will be noted that the finished weight of the hogs of these three lots varied only 7 pounds. The average gains made daily were .83, .87 and 1.13, respectively.

The grain required per pound of gain was 377 pounds for the light fed lot, 391 pounds for the medium fed lot, and 395 pounds for the heavy fed lot. This means that 12.86 bushels of corn was required to fatten a pig under the system of light feeding for the first four months after weaning, 13.54 bushels for the medium feeding system, and 12.80 bushels for the system of rather heavy feeding from weaning time. Under the three systems of feeding, then, we find that very light feeding on pasture and then heavy feeding at fattening time gives somewhat cheaper gains, pound for pound, than a heavy feed from weaning time, but that it takes two months longer to get the former ready for market. The time to have the hogs ready for market would depend on market conditions, prevalence of disease, etc. Moreover, the difference is so small that of an expensive season for finishing hogs, such as the cold months of winter or the hot months of summer, can profitably be avoided by forcing the hogs from the start.

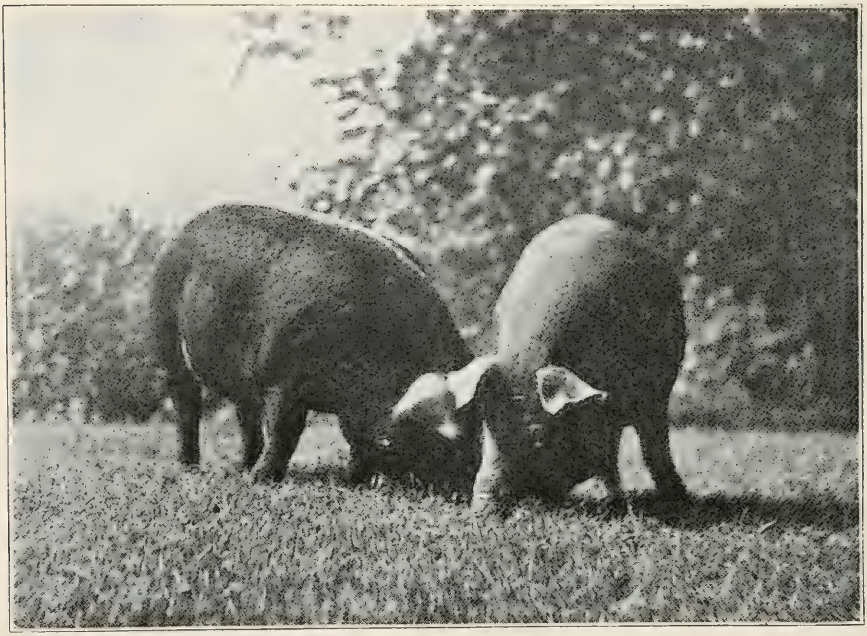

Fig. 4. BLUEGRASS COMES EARLY AND STAYS LATE.

Some conclusions drawn from the results of feeding hogs on alfalfa at the Nebraska Experiment Station,* are as follows:

"A light ration is not the most economical for growing pigs, unless under peculiar circumstances, when alfalfa is abundant, grain very high in price, and market conditions warrant holding the hogs. It seems probable that two or more pounds of corn daily, per hundredweight of hogs, is more profitable than a lighter ration.

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* Neb. Bul. 99.

"Mature hogs thin in flesh may be expected to gain about ½ pound per head daily on alfalfa without grain.

"The cost of gain is not a reliable criterion of profit. A cheap gain may be so slow as to be unprofitable. Time, labor and investment should be considered when reckoning profits. A full grain ration, though making the gain more costly, usually gives greater profits, because of the larger amount of business transacted in a given time with a given number of hogs."

Finishing Fall Pigs on Clover and Alfalfa Pasture.—Corn is the farmer's mainstay for fitting hogs for the market. While many of our correspondents have their fall pigs ready for market before pasturing time comes in the spring, a majority keep them late enough to require pasture for them for at least a short time in the early summer. As about 90 per cent. of the summer pastures for fall pigs, as shown in the replies of our correspondents, are either clover or alfalfa, or contain clover of some form, the feeding of fall pigs on grass is almost identical with feeding on clover or alfalfa pasture. Of 145 replies as to what grain was fed on grass to fall pigs in summer, 101 gave corn alone, and 43 gave corn in connection with some other feed; 11 fed corn and shipstuff or shorts; 5 corn and bran; 4 corn and milk; 2 corn and tankage; 2 corn and meat meal; 2 corn and linseed oil meal; 2 corn and wheat, and the other 15 fed corn with some combination of the above-mentioned feeds, while one reply was "ground wheat or rye." The number that use the different feeds are as follows:

Corn	144
Shorts or middlings	17
Bran	7
Oilmeal	8
Meatmeal	2
Tankage	2
Wheat	4
Oats	3
Rye	1
Kaffir Corn	1
Milk	5

It will be noted that when a supplement is fed with corn, the most popular feeds are middlings, bran and oilmeal—the latter usually in a mixture with some other feed. When on a clover or alfalfa pasture corn usually needs no supplement if pasture is good unless very rapid gains are desired and corn is very high and the supplements can be easily secured.

The effect of feeding a supplement to corn on alfalfa pasture is shown by results given by Nebraska Experiment Station,* where three lots of 10 145-lb. fall pigs were finished on alfalfa pasture, beginning May 14 and fed for 56 days on corn alone or different proportions of tankage and corn.

Ration with pasture.	Weight at end.	Gain per pig.	Daily gain.	Grain per 100 lbs. gain.
Soaked corn	216	71	1.26	416
Soaked corn 95%, tankage 5%	229	85	1.51	371
Soaked corn, 90%, tankage 10%	230	86	1.53	366

These results, as was expected, show a more rapid gain where a supplement like tankage was fed with corn, than with corn alone, thus making the hogs come to a good marketable weight at a somewhat earlier age. It will be noted, however, that corn alone and alfalfa pasture made a gain of 1¼ pounds per day for a period of 56 days. The corn and tankage made a gain of a little more than 1½ pounds per day. The grain required to make 100 pounds of gain was much less when tankage was fed with corn than when corn alone was used, the amounts being 366 pounds for one-tenth tankage ration per 100 pounds gain, 371 pounds for one-twentieth tankage ration, and 416 pounds for corn alone. At the price of corn at 60 cents a bushel, and tankage at $44 per ton, the cost per 100 pounds gain, not counting pasture, was $4.45 for corn alone, $4.18 for nineteen-twentieth corn, and one-twentieth tankage, and $4.33 for nine-tenth corn and one-tenth tankage, thus showing a slight saving by feeding a small amount of tankage with corn. This experiment shows that if the extra work of providing and feeding tankage is not too great, it may pay, especially when pastures are not very strong and corn is high-priced, to feed some kind of supplement with corn to hogs on clover or alfalfa pasture. As a general proposition, however, the margin in favor of a supplement to corn on clover or alfalfa is not enough to justify the extra labor of securing and feeding it.

COWPEAS AS HOG PASTURE.

Every farmer is beginning to realize that a ration of corn alone is not the most profitable one upon which to fatten hogs, and it is a recognized fact that home-grown protein is the cheapest form with which to balance a ration of corn. The legumes, such as clover and alfalfa, furnish the nitrogenous pasture, but a home grown grain to feed with corn is not supplied by either of these two crops. There is, however, another legume that grows quickly, builds up the land and furnishes a form of protein that is available at the time of year when it is most needed for finishing hogs. This plant is the cowpea. It requires from 70 to 100 days to mature, and if planted May 15 to June 1, will be ready to pasture by the middle of August or sooner, when the first pods are beginning to ripen. The value of this plant as a forage crop for hogs is just beginning to be recognized by the farmers of this State. It has been grown in the southern part of the State for several years, and, to some extent, in the northern half, but its great value as a hog-fattener is not yet realized except in the extreme southern portions of the State where they are generally grown. An acre of well-grown cowpeas turned on when the pods are ripening, will, as was learned from the farmers using the forage, pasture 15 to 25 100-pound hogs for from one to two months in the fall. Cowpeas are also valuable for sowing in the corn at the last cultivation and then turning hogs in when the corn is past "roasting ear."

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*Nebraska Bulletin 94.

The cowpea is a southern plant and will not stand too early planting. It should be sown either broadcast or drilled when the ground is warm, from the last part of May to July 10th in Central Missouri, and varying as the latitude changes. If to be grown with corn, sow at the last plowing of corn. The amount of seed required per acre when sown alone is from three-fourths to one-half bushel per acre. In the corn, one-third to one-half bushel is the usual amount. For hog pasture it is recommended that they be grown in rows and cultivated in order to form more seed for the hogs.

The value of cowpea pasture for hogs being fed corn is shown by a trial at the Alabama Experiment Station,* where a full feed of corn was given for 42 days to 50 pound hogs running on cowpea pasture when the pods were ripening. One lot of three pigs was fed corn alone in a dry lot, while the other, containing an equal number of pigs, was in the cowpea forage, the results being as follows:

	Daily Gain.	Grain per 100 lbs. gain.
Corn alone	.36	586
Corn on cowpeas	.97	307

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*Alabama Bulletin 93.

It will be noted that the gains on these 50-pound shoats were doubled when hogs were run on a cowpea pasture. The corn required to make 100 pounds of gain was very little over one-half as much when fed with cowpea pasture as when fed alone.

Its value is recognized by some farmers in this State, and their experience is indicated by the following statements:

One man in Southeast Missouri says, "I always sow a crop of cowpeas and turn the hogs in when the pods are beginning to ripen. Last year five acres of cowpeas fattened 23 head of spring pigs and there was enough feed left for the sows and pigs for a time after the fat hogs were gone. These fattening hogs received no grain except the cowpeas, and made a gain of two pounds daily. I also drill cowpeas in corn at the last cultivation and hog them down after the corn is gathered."

Another man from the same community says, "I use clover pasture in summer and cowpea pasture in the fall. I turn the hogs in when the pods are ripening, and feed corn and sometimes milk with the cowpeas. I like the cowpeas as pasture better than clover."

The value of sowing cowpeas in corn is best shown by the experience of some of the good hog raisers of this State. One gentleman in Northwest Missouri, who keeps his fall pigs until green corn comes next fall before fattening, says: "Several times I have mixed an early variety of corn with Whippoorwill cowpeas, equal parts in the planter box and planted with an old-fashioned hand drop corn planter. Drop at every step of the horses, or closer, thus putting one to three grains of corn and two to five peas in each hill. Turn the hogs into this about September 1. I have made 90 pounds gain per hog in four weeks and have fattened 10 to 15 hogs per acre. I think I have made over 1,000 pounds gain to the acre."

A man in Central Missouri says: "The first corn I put out is ninety day corn, and the next is Reid's Yellow Dent. When I finish plowing the corn which I want to hog down, I drill cowpeas between the rows with a one-horse corn drill. The cowpeas are ready to graze as soon as early corn is mature. When the hogs have the corn and cowpeas cleaned up well, I disk the ground well and sow rye for a winter pasture."

A man in West-Central Missouri says: "Cowpeas sown broadcast in corn and plowed in with eagle-claw cultivators when 'laying-by' the corn, has been the most profitable experiment I have ever tried. A bunch of 60 to 70 shoats allowed to 'help themselves' to five or six acres and fed a small amount of cooked oats daily will make remarkable gains, and when the corn and peas are gone, can be profitably finished on corn alone."

One other method of sowing cowpeas in corn that has proven very successful, is to drill from two to three rows of the peas between corn rows with a one-horse grain drill at the last cultivation of the corn. This would be pastured down in the same manner as indicated in the quotations used above. In hogging down corn, however, too large an area should not be pastured at the same time, else the hogs will wander too much and waste more grain than if confined to the amount of ground they can clear in about a month. Pigs running with large hogs also eat scattered grain and thus prevent waste.

RAPE FOR HOGS.

On the best regulated farm there are times during the spring, summer or fall when the regular pasture is short, or when it has been injured until it will not make sufficient pasture for the hogs. On such occasions, a quick-growing plant that will furnish a large amount of forage per acre is exceedingly useful. The rape plant has been found to fit in exceedingly well on such occasions. In reply to the question as to the best forage crop for hogs, four correspondents in the northern and eight correspondents in the southern part of the State said "rape;" one said "rape and oats;" and another "cane at heading time and rape." After many years experience with rape, Professor Carlyle, at the Wisconsin Experiment Station, drew the following conclusions:

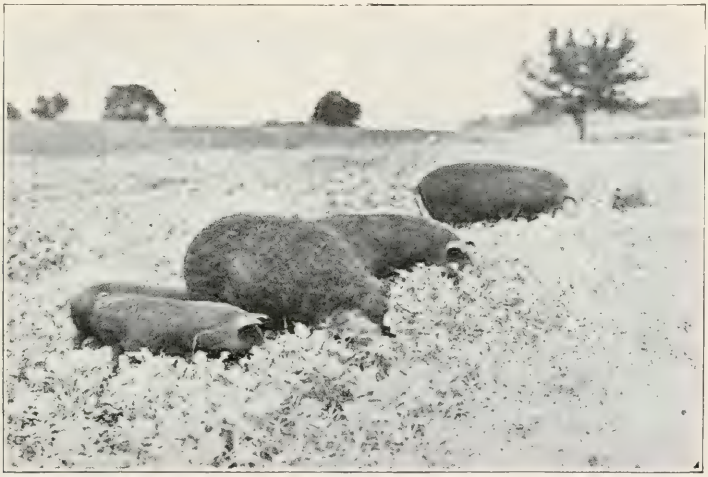

Fig. 5. RAPE MAKES A GOOD HOG PASTURE.

"With pigs from four to ten months old, representing the various breeds of swine, an acre of rape, when properly grown, has a feeding value, when combined with a ration of corn and shorts, equivalent to 2,436 pounds of the mixture of these grain feeds.

"Rape is a better green forage for growing pigs than good clover pasture, the pigs fed upon rape having made on the average 100 pounds of gain on 33.5 pounds less grain than was required by the pigs fed on clover pasture.

"Rape should be sown for this purpose in drills thirty inches apart to facilitate cultivation of the ground after each crop of forage is eaten off.

"Hogs should not be turned in until the crop is twelve to fourteen inches high, and should be prevented from rooting while pasturing rape.

"Rape alone is not a satisfactory feed. Hogs will just about maintain their weight on it."

The value of rape, compared with clover, can be seen by the following results of the Wisconsin Experiment Station:†

	1898.		1899.	
	Rape.	Clover.	Rape.	Clover.
No. pigs	19	19	21	21
Initial weight	111	110	101.9	101.8
Grain per 100 lbs. gain	391	439	332	346
Daily gain per pig	.87	.78	1.27	1.22

It will be noted that not only was there a saving of grain, but that the gains were more rapid when rape pasture was used instead of clover. These results have been duplicated at various experiment stations, among them Missouri and Kansas, the latter reporting the following with rape compared with alfalfa, pastured ninety-eight days, with ten 52-pound pigs:*

Pasture.	Gain per pig.	Average daily gain.	Grain per 100 lbs. gain.
Rape	107.6	1.09	301
Alfalfa	107.8	1.10	300

It is seen that pigs on rape pasture made almost exactly the same gains as those on alfalfa pasture, with the same amount of grain required to make a pound of gain.

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†Wis. Ex. Sta. Annual Report, 1898 and 1899.
*Kansas Press Bulletin 122.

Since experience shows that for a short period rape makes a splendid hog pasture, there is no reason for a lack of forage when clover is winter killed, or land is pastured too heavily, because rape can be sown very early or very late, thus making pastures at any time of the spring, summer or fall.

Rape is a plant of the cabbage family, closely resembling it in manner of growth and character of forage. It is a rather cool weather plant, and can be sown very early in spring, as soon as there is no danger of a severe frost. It will endure a pretty severe frost in the fall before it is injured; in fact, it may often be used for pasture after it has been partly frozen, provided stock is kept off when it is frozen.

It is a gross feeder, and does best on very fertile or heavily manured soil, but does fairly well where corn and wheat thrive. It is a very rapid grower, and if sown alone on good land, will be sixteen to eighteen inches high in six to eight weeks. When sowing rape alone, it is best to have a well-prepared seed bed, well pulverized, and sown in drills two and one-half feet apart and cultivate until eight inches high. It may also be sown broadcast, and either harrowed or disked into the ground. When sown in drills, about two or three pounds of seed per acre is sufficient, but if sown broadcast, three to five pounds, and sometimes more are needed.

At the Missouri Experiment Station, a mixture of rape and oats has given one of the most productive pastures ever used. It can be sown either at the same time as the oats or can be sown and harrowed in after the oats are up. Rape may also be sown in rye and give excellent pasture. The Dwarf Essex variety has been giving the best results in this State.

When pasturing rape, the hogs should not be turned on until the plants are twelve to fourteen inches or, better still, sixteen to eighteen inches high. When pastured before this time, the hogs pull up the young plants and kill them, thus destroying the pasture. Rape should not be pastured so closely that nothing except the bare stalk remains. A few leaves or parts of leaves should be left to start new growth. If planted in drills and cultivated after each period of pasturing, three crops may be obtained from each set of plants yearly.

Rape can be sown so as to furnish a forage at any time of the growing season, and if necessary can be used as the principal pasture for hogs. It must not, however, be pastured too closely and must be given opportunity to get well started after being pastured. The amount of land sown to rape need not be large, because it is worthless except for pasture or soiling, and one acre will pasture fifteen to twenty hogs for a period of two or three months.

OATS AS A HOG PASTURE.

Another plant that can be sown for a time of pasture shortage is oats. Six of our correspondents mention it as a pasture for spring pigs and seven as a summer pasture for fall pigs, while four mention it in connection with rye, cane, kale or cowpeas, as the best forage to grow for hogs. Early sown oats will do to pasture early in the spring, when the hogs have to be taken from the rye or wheat. It may also be sown with rape and make more forage than with oats alone, but there is the danger of the oats getting too woody and being trampled down. Oats can be pastured lightly from the time they are three or four inches high, and continued until heads are forming, when the hogs should be removed until the grain is in the milk, when, if desirable, they can again be turned in and allowed to harvest the grain crop. Oats are especially good for sows and pigs, and for furnishing early pasture. The composition of the oat plant is such that it does not furnish the proper nutrients to balance a ration of corn alone for growing hogs; hence on oat pasture the hogs should have a limited amount of nitrogenous supplement, such as shipstuff, linseed oilmeal, or a small amount of tankage or meat meal.

SORGHUM OR CANE.

Sorghum deserves a good place in the list of useful short-lived forage crops for hogs for hot weather and drouths. It is especially useful on account of the large number of hogs it will pasture, furnishing enough forage for twenty to thirty hogs per acre. It is not as palatable and nutritious as the other forage crops mentioned, but is used by many as a dry weather crop. One man says that sorghum, when heading, furnishes the best forage he has used. It can be sown in May and be ready for pasture in July. It will last during July, August and September, and often later, and is especially useful during the dry months. The composition of sorghum is also such that it requires a supplement to the corn fed to obtain the best results.

PUMPKINS.

Pumpkins are especially relished by swine, and have been fed with very satisfactory results. While not distinctly a forage crop, they are so useful in starting pigs on a ration of corn in fall or for feeding sows and pigs that they deserve a place among green crops for hogs. Pumpkin seeds are very rich in protein, and also act as a vermifuge, clearing animals of worms and putting the digestive organs in excellent condition. There is nothing better for putting the animal in good "tone" than pumpkins, but care should be taken that too many seeds are not eaten and the system thereby deranged.

The practice of planting pumpkins in corn or in stumpy ground makes them a very cheap crop to grow. One man in central Missouri plants as high as five acres of pumpkins to feed to his hogs. Pumpkins of inferior quality should be fed first, thus leaving the soundest for storing for later use. Experiments at many state experiment stations have proven that it is better to feed pumpkins raw than cooked. The character of the pumpkin makes it better to feed with grain than with a more bulky ration, as is shown by a trial at the New Hampshire Experiment Station, where two lots of shoats were fed on raw pumpkins, one lot receiving in addition milk, and the other milk and corn meal. The first lot made a daily gain per pig of 1.12 pounds, while the latter made a gain of 2.26 pounds. The use of this crop should become more general, especially for starting hogs on a heavy feeding period.

SOYBEANS.

A crop that should be given more attention by the farmers is soybeans. This plant is of the cowpea family, and differs from it in only a few particulars. It has not, however, become so widely used in this State as cowpeas, probably because it has to be inoculated before it will enrich the soil or grow to the best advantage. At the Missouri Experiment Station, soybeans have given good results, and the indications are that they can be grown in all localities of this State. They furnish more seed than cowpeas, but not so much forage, so for hogging down they are somewhat superior to cowpeas on account of the greater amount of seed produced. The general directions for seeding, pasturing, etc., are the same as for cowpeas. This forage has been found very profitable in southern Illinois, Indiana and Kansas, where it is being grown extensively as a hog feed. Numerous trials at different places in these states have proven that soybeans are one of the best forages that they can grow. There should be more attention paid to this plant in Missouri.

ARTICHOKES.

While artichokes are not generally grown in this State, a few men are using the crop for fall pasture. Artichokes should be planted near the hog lot and be harvested by turning the hogs in and allowing them to eat the tubers out of the ground. If a crop of the same kind is desired on the same ground the next year, the hogs should be removed before the tubers are all eaten, thus leaving the land seeded. Next year this land will be cultivated and another crop raised without reseeding. Artichokes may be planted in rows twenty-one to twenty-four inches apart, and eighteen inches apart in the row, and cutivated. One acre will pasture fifteen to twenty-five hogs from October until the ground is frozen. The artichoke is superior to common beets or turnips. Results from the Oregon Experiment Station show that, compared with grain alone, the artichokes effected a saving of nearly two pounds of grain per pound of gain on the hogs. The hogs fed on artichokes are also healthier than when not receiving any green feed.

WINTER AND EARLY SPRING PASTURE.

There is probably no greater loss to the hog raisers of the State than the lack of a suitable pasture for hogs in winter. Of course, there are times during the winter when it is entirely impossible for hogs to get anything green to eat, but during a large part of the winter the weather is such that it is possible for them to graze upon some kind of pasture. One man in northeast Missouri says: ''I have made a specialty of growing crops for winter and early spring pasture, and have had good results. Hogs having access to the winter pastures have made double the amount of gain over the ones without pasture, and on one-half the amount of corn eaten.'' Pasture in winter and early spring serves not only the purpose of furnishing a green feed, but also induces the hogs to take exercise, which they would not otherwise do, both of which will tend to keep the shoats in a healthy, vigorous condition. With some kind of green forage to pick at, pigs will take sufficient exercise that practically all danger of thumps will be removed. As is well known, two of the worst things that the hog raiser has to guard against in winter are thumps and constipation, both due, to a large extent, to a lack of exercise and some laxative food, and which can be remedied by a green pasture during as many of the winter months as possible. Of course, it is impossible to furnish the best of pasture for three months, from December 15 to March 15, but even during three months a field of rye, wheat or bluegrass makes an excellent place for hogs to forage.

For early winter pasture, the succulent forage may do well until freezing weather. Clover, alfalfa, etc., if of good growth, may last that long. Rape will make good pasture sometimes as late as Christmas. Cowpeas can be pastured late in the fall, and give a large amount of forage; but from freezing time until grass comes in spring, any green forage for hogs requires a special crop. Rye, wheat and bluegrass are about the only plants that are of much value for the winter months. If the bluegrass has a good growth in the fall it makes excellent pasture in winter and early spring. If pastured close in the fall, however, this grass furnishes little pasture during the winter. Wheat is in general use as a winter crop for pigs, and can be sown at the right time to make a good crop of grain the next summer, and at the same time furnish good pasture in either winter or early spring. Rye is in more general use as a winter forage for hogs than any other single crop, as is shown by the fact that fifty-six out of 156 replies as to what winter pasture was provided for hogs, gave rye; thirty-seven said no pasture was furnished, twenty-nine gave wheat, and thirty-one gave bluegrass. Rye for winter pasture can be sown any time from August to October, and give good returns. Many correspondents mention sowing rye in corn in August and using it as pasture after the corn is gathered, while others report sowing it as late as to give time to put it in after corn has been hogged down. Rye will make an early start in spring and furnish green feed until clover, etc., will do to pasture, or until some early spring sown crop, such as oats or rape, are ready for use.

Fig. 6. A GREEN PASTURE MAKES CHEAP PORK.

One of the worst features about using rye as pasture is that it is so hard to prevent from mixing with wheat and injuring the latter. It should be sown in a place that is to be plowed up in the spring and planted to corn, so as to kill any rye that may have escaped the hogs. Clover can be sown in rye, and the entire crop pastured. Artichokes also make a good winter pasture when the ground is not frozen. They should be planted and cultivated the same as directed in a previous discussion of this plant.

HOW TO GET A PASTURE WHEN CLOVER FAILS.

The farmer is always in danger of his plans being frustrated by some bad weather killing the crop intended for summer pasture. As clover is the principal hog pasture of this State, the question is, "What shall I do when clover is killed?" A great number of men put the land in corn and either sell the hogs or let them have whatever is handy or convenient. There is no need for this, however, as for pasture in May, oats or rape, or a mixture of the two, can be sown as soon as frost is out of the ground. This will make as good pasture as clover, and will provide forage for about twice the number of hogs per acre. This pasture will last until another of the same kind can be sown about three or four weeks later. By alternating between these two lots, and not pasturing the rape so close that the stems are bare, new growth will keep coming until spring sown clover is ready to pasture, or, if this fails, a small patch of sorghum will be of use until a field of cowpeas planted May 15th to 30th, is ready to pasture in August. After the cowpea field is cleared, later sown cowpeas or a patch of late sown rape will furnish forage for late fall, or rye and crimson clover sown in corn will make good late fall pasture. But with oats and rape sown six to eight weeks before use for early summer, rape sown six to eight weeks before use for summer and late fall, and cowpeas planted two and one-half to three months before using for late summer and fall pasture, no man need fear to raise a crop of hogs on account of his clover dying. It is entirely possible and practical to furnish the best of hog pasture without having either bluegrass or clover, and on less land, but at a slightly greater cost in money and time, by using small fields of quick growing crops, such as oats, rape, cowpeas, cane or artichokes. A list of pastures that can be made available for the different months of the year, and the time for planting, follows:

PASTURE FOR HOGS.

Month.	Crop.	Time of sowing.	No. of hogs per acre.
April	Bluegrass		6–8
	Rye	August and September	8–12
	Wheat	September and October	6–10
May	Bluegrass and white clover		6–10
	Clover	Previous spring	8–12
	Oats and rape	April 1 to 10	15–20
	Alfalfa	Not less than 1 year old	15–20
	Timothy	Previous year	8–12
June	Clover	Previous year	8–12
	Alfalfa	Not less than 1 year	15–20
	Rape and oats	April 15 to 30	20–25
	Bluegrass and white clover		8–10
July	Clover and timothy	Old or spring sown	8–12
	Alfalfa	1 year old	15–20
	Rape	May 15 to June 1	12–15
	Sorghum	April 15 to May 1	20-25
August	Alfalfa	1 year old or over	12–15
	Clover	Spring sown	8–12
	Rape	April 1-10, grazed down once	12–15
	Sorghum	June 1 to 10	20 25
September	Alfalfa	Previous year	15–20
	Rape	July or April 15-30 grazed down once	20–25
	Bluegrass and white clover		6–8
	Cowpeas	June 15	12–20
	Pumpkins	Alone or in corn June or July 1.	fed
	Sorghum	July 1	20–25
October	Bluegrass and white clover		5–7
	Timothy and clover	Spring	8–10
	Alfalfa	1 year old	12–15
	Cowpeas	July in corn	12–15
	Rye	August and September	8–10
	Wheat	September	6–8
November	Bluegrass		6–8
	Rye and crimson clover	August and September	8–10
	Rape	July and August or 2nd growth	12–15
	Clover	Spring	10
	Alfalfa		10–12
December	Rye	August and September	
	Wheat	September and October	
	Bluegrass		
Jan. and Feb	Rye	August and September	
	Wheat	September and October	
	Bluegrass		

PASTURE FOR HOGS—Continued.

Month.	Crop.	Time of sowing.	No. of hogs per acre.
March	Rye	August and September	
	Wheat	September and October	
	Bluegrass		

Note—These dates are given for central Missouri and will be too early by a few days for north Missouri and too late by a few days for South Missouri.

With such short growing crops available for making hog pasture on short notice, a rotation can be followed with an assurance that weather will not entirely upset all plans and unbalance the rotation.

DAIRY SUGGESTIONS FROM EUROPEAN CONDITIONS AS SEEN IN THE BRITISH ISLES, HOLLAND AND DENMARK.*

(By Wilber J. Fraser, Chief in Dairy Husbandry, and Royden E. Brand, Assistant in Dairy Husbandry, University of Illinois. Reprinted from Bulletin No. 140, University of Illinois Agricultural Experiment Station.)

A study of the dairy conditions of Illinois shows conclusively that the dairymen are not getting the profits they should from the money and labor invested in the business of producing milk. Since there are dairy sections in Europe where they are feeding American grown grain to their cows and producing dairy products which are sold on European markets in competition with ours, it is important for the American dairymen to know what is wrong with our methods, and the details of the system that permits profitable dairying on land worth from five to ten times as much as that in the Central West.

This bulletin is the result of a summer spent in making a detailed study of the methods employed in the production of milk on the farms of the intensive dairy countries of Great Britain, Holland and Denmark. The main purpose in the study was to look for points in which European dairymen excel. This was a second visit for the Chief in Dairy Husbandry, who eight years before noted the important features at that time, and the observations of the first visit, coupled with the more mature and deliberate opinions of the second, are herewith compiled. While many of the foreign conditions are, of course, vastly different from ours, and we cannot copy all of their methods directly, the underlying principles of dairying are the same the world over, and the high points of their success are uniformly good cows, economical feeding and care, and sanitary methods, resulting in dairy products of high quality. The observance or nonobservance of these points make the difference between success and failure, and are of vital importance to all American dairymen.

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*The cuts for this bulletin were made from photos taken by the authors.

DAIRYING IN THE BRITISH ISLES, ENGLAND.

Rural England.

In England the greater part of the land is owned by noblemen, who care quite as much for beauty as for profit, in consequence of which great attention is paid to the artistic appearance of the farms, and much pride is taken in keeping everything neat and orderly. No fence corners or hedge rows are left to grow up with weeds, nor machinery allowed to stand in the fields. England certainly possesses a charm that is all her own. The larger portion of the country is in grass, and neatly trimmed hedges divide the beautiful, undulating pastures and meadows into small fields, where numerous clumps of trees are allowed to grow. Covering the whole country is a network of winding macadamized roads, lined on both sides with hedge rows and trees, and leading through the fields in every direction are foot paths. The heather-covered hills, vine-clad cottages, and cattle dotting the pastures, make a beautiful picture not soon forgotten.

Typical English Landscape. Milking Short-horns at Pasture.

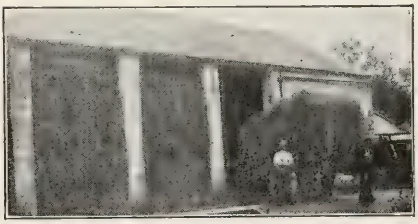
FARM MANAGEMENT.

The farms vary in size from fifty to three hundred and fifty acres, averaging about one hundred and twenty acres, and rent for from $2.50 to $10 per acre, depending upon the soil. Their valuation is considered to be thirty times the rental. These farms are often rented by the same family from generation to generation and it is this stability which makes the English farmer such a successful breeder of live stock. The English renter must not be confused with the European peasant; he is usually a well-to-do and well-educated man, comfortably situated, contented with his lot, and his heart is in his work.

Climatic conditions affect the crops grown, and while there is more uniformity of temperature, there being neither intense heat nor cold, yet very little corn can be raised. On the other hand, grass grows abundantly, as the rainfall is plentiful and well distributed, and for this reason the greater part of the country is in pasture or meadow, only a comparatively small portion being under cultivation. There is also a growing tendency to have more pasture and less tillable land, owing to the difficulty with which labor is obtained. Good permanent grass land is higher priced than arable land. Agricultural conditions vary in England, as in other countries, and it naturally follows that one section differs from another.

Heavy English cart commonly used on the dairy farms and for delivering milk.

Usually grass seed is put in with oats or wheat and always pastured after the grain is cut. A large number of grasses are sown together, as the grasses adapted to the soil will thrive best. A favorite mixture consists of meadow and tall fescue, perennial rye grass, timothy, cock's foot, sweet vernal and red, white and alsike clover. Pastures that have been down some time either run to weeds or establish themselves. The chief difficulty is to have the ground firm, and the tramping of stock does much good if the ground is not too wet. The pastures should be cared for by careful stocking, to prevent coarse grasses from seeding and running out the smaller grasses. If the coarse grasses predominate, the pasture then becomes open in the bottom. Pasturing a mixture of stock is best, as they prefer different grasses. Favorite English sayings are: "Never interfere with a good pasture when once it is established," and "Any laborer can look after arable land, but it requires a master to look after grass land."



English Farm at Hay Barracks.

Oats, wheat, barley and rye are the grains commonly raised. These are harvested by cutting a swath around the field with a cradle and then using a self-binder, as in this country. The crops which are cultivated while growing are mostly roots. Mangels are grown extensively for stock feeding, and these commonly yield from twenty-five to thirty tons per acre.

The carts, wagons, tools and implements used by the English farmers seem very crude and clumsy, compared with those in the United States, but on the other hand, they are more substantial and much better made. The English farmers are fast seeing the convenience and advantage of our machinery, and are not only using much that is made in the United States and Canada, but are designing and manufacturing implements quite like our own. English Agriculturists freely admit that they have learned much from Americans about improving and developing farm machinery.

Shire mares generally used on the farms of England.

LIVE STOCK.

The Englishman is a lover of fine stock, and as a rule has a much better quality than is seen in this country. The horses used on the farms are largely Shires. Being of the heavy draft type, they are frequently used singly, and very seldom does one man drive more than two horses at a time on the farms.

Herd of dairy Short-horns which has been bred almost entirely for milk production for twelve years. Average production 6,000 pounds milk per cow per year. White cow standing produced 7,000 pounds milk with first calf, and over 11,000 pounds last year. Average test 3.8 per cent. fat.

Nearly all the cattle seen in England are Short Horns, with now and then a few Herefords, Devons and Jerseys. Most of the milk of England is produced by milking Short Horns. Several excellent breeders of Dairy Short Horns are breeding for milk alone, paying no attention to beef. In this way two classes of Short Horns are being developed that are almost as different as Holstein-Friesians and Aberdeen Angus.

FEED AND CARE.

It is estimated that on good land it requires from 2½ to 3 acres to keep a cow a year. The cows are turned to pasture about the middle of May, and the time at which they are taken off in the fall varies from October 1 to November 1, depending upon the season. Cows are not soiled, and pasture grass is generally depended upon to furnish the entire feed for the summer. When this is done, it requires about two acres of pasture per cow. This will support the cows until the first of August, when they are then turned on the aftermath in the meadow, and from this time on changed back and forth from the pasture to the meadow. Grain is seldom fed to cows on pasture, until after the first of August, when a small amount of cotton seed cake is fed to many of the best milkers. Ordinarily, the winter ration for dairy cows consists of 40 to 70 pounds of roots; 15 pounds of straw; 7 pounds of hay; and 8 pounds mixed meal and cake. The roughage is fed three times a day and the grain twice—the grain being fed according to the milk flow, and is cut off entirely when the cow is dry.

Red Polled cows common in Eastern England.

Jerseys at pasture. Seen only occasionally in England.

At the Agricultural shows there were numerous and extensive exhibits of condiments and condition powders for stock. Talking with stockmen on the farms, it was learned that there is an enormous amount of these materials fed in England. It would seem from this that English stockmen, like many Americans, overestimate the value of these preparations.

Dairy Short-horn that traces to Volume I of herd book.

As straw is valuable for fodder, only a sufficient amount is used for bedding to take the rough edges off the cobble stones or brick with which the stable floor is paved. A noticeable feature is the care taken of manure. The best farmers have sheds under which it is kept to avoid waste. The barn yards are paved with cobble stones to keep the cows out of the mud.

During the summer, cows obtain their water from water holes, brooks and tile drains. In winter they are watered from a trough in the yard, the water never being warmed, as the winters are not severe.

FARM BUILDINGS.

The buildings on the farms are substantial, usually being constructed of stone or brick, and having slate or tile roofs. The houses are comfortable, and much attention is given to neat and artistic plantings around the homes. Our farmers have much to learn from their English cousins in this respect.

English laborer's cottage.

CITY MILK SUPPLY.

England, with no greater area than Illinois, has a population nearly half as great as that of the United States, and the question of supplying this enormous number of people with fresh milk is a problem of magnitude.

In small towns, milk is delivered warm from the cow twice a day. In the large cities it must be cooled to stand shipping and the unavoidable delay in delivery. As the climate is cool, it is not as necessary to have the milk chilled to a low temperature during the summer as it is in the States. The customary price to the farmer is $1.40 per 100 pounds for the summer six months, and $1.60 for the winter six months, making an average of $1.50 per 100 pounds, after the freight is paid.

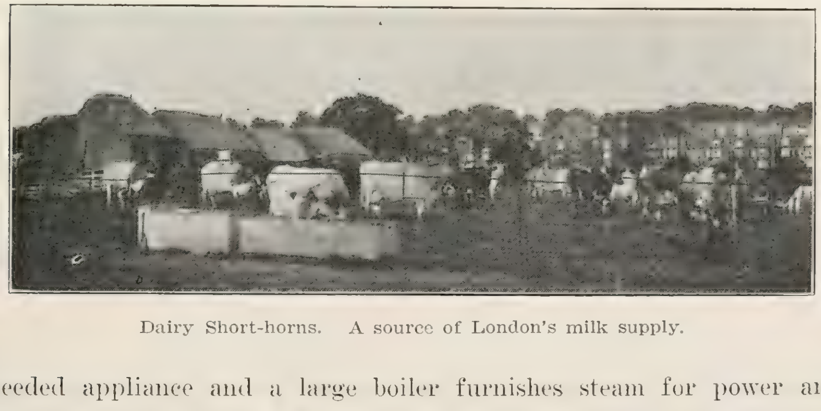
Dairy Short-horn prize winners at the Royal Show.

An example is cited of a dairy company distributing milk, one of the most extensive in Manchester, owned and operated by Mr. Hailwood. He started in the business while young, and has developed a retail trade until at the present time he owns two farms, and runs twenty one-horse delivery carts and eight distributing shops in the city of Manchester, where milk is sold by the glass or quart. He rents a double shop in the main part of the city for $4,000 a year, where he serves refreshments and employs twenty people. He pays the laborers that work inside his dairies, and also those who deliver milk, six dollars a week.

He buys from 20,000 to 30,000 pounds of milk a day, selling it at 6 cents a quart in summer and 7 cents in winter. Most of the milk is delivered in bulk and in pint and quart buckets, none of the milk being bottled, with the exception of a small amount which is pasteurized and sold in small-necked glass bottles. He sells 50 per cent. cream in ten-ounce jars at 12 cents. If the jar is returned, 1 cent is refunded.

City milk supply depot, showing milk churns and delivery carts.

Another example of a dairy company supplying a city with milk is a concern doing a high class buiness in one of the smaller cities. It has as a depot an excellent two-story brick building with an attractive shop in front where milk is sold by the glass, or in larger quantities. The floors are of cement and the walls of white glazed brick. One entire side of the building and a portion of the roof are of glass, giving ample light in the second story, where most of the milk is handled. A wash room for cleaning cans and dairy utensils is fitted up with every needed appliance and a large boiler furnishes steam for power and sterilizing. There is also a churn room where any milk or cream that is left unsold is converted into butter. About 7,000 pounds of milk are brought daily to this depot by the farmers in the vicinity. The milk is filtered, pasteurized and thoroughly cooled, and is then ready for the consumer. The twenty men employed in preparing and delivering the



Dairy Short-horns. A source of London's milk supply.

milk are required to wear white suits. The milk is delivered with twenty push carts, each having a large can, called a milk churn, swung between the wheels, and attached to the cart are also several pails, some containing cream and others to be used in carrying milk up the hills where it is too steep to push the cart. As the advantages of thoroughly cooling the milk are not appreciated, they incur the extra labor and expense of having the milk delivered twice a day at the depot and also to the customers.

MANUFACTURED PRODUCTS.

England has practically no creameries or cheese factories. Nearly all of the milk not used for direct consumption is made into butter or cheese on the farm, by far the greater part being converted into sweet cream butter. The excellent and uniform quality of the butter and cheese used on the tables at hotels and in the home of England is everywhere noticeable. An Englishman would not think of serving butter of as poor a quality as much of that found on the American markets.

Dairy building on Lord Rothschid's estate.

As the population of England is over seven times as dense as that of Illinois, a large percentage of the milk produced is used for direct consumption, and most of the butter and cheese consumed has to be imported from other countries. The United States is enjoying practically none of this trade. Denmark and Holland, by studying English tastes and demands, have captured the greater part of the dairy imports and are producing them on land worth from $500 to $1,000 an acre.

IRELAND.

Although having the advantage of favorable natural conditions, the Emerald Isle falls behind in agricultural progress, both as regards the peasantry and the capability of the soil, and it naturally follows that the dairy industry is on a par with the other agricultural operations.

Being directly influenced by the Gulf Stream, Ireland has a climate which—moist in summer, moderate in winter—exposes almost 20,000,000 acres of land to a long growing season. The climate and soil are especially adapted to the growing of pasture, hay and green crops, and the unique natural advantages particularly adapt the country to dairying rather than grain growing. The general size of the farms also lends itself to the intensive methods, which are practiced where dairying is rightly conducted. Yet, as was mentioned, the agricultural conditions are in some respects deplorable. This is especially true of the more densely populated region of the Southwest, where the land is poor.

In the north of Ireland there is much mixed farming, while in the south nearly all of the land is in grass. In the north and central eastern parts of Ireland the farms are small. The owners of large estates divide up the land and rent it out in small amounts to numerous tenants, many of these having not over twenty acres.

In striking contrast to the careful housing and care of the dairy cattle in England and Scotland, Ireland practices, in many respects, the loosest kind of dairy methods. Excepting near the larger cities, where a constant supply of milk is required, the cows are generally allowed to go dry in the fall when the pastures fail. During the winter their only shelter may be an open shed. Many of the barns are small and have no loft or hay room, thus necessitating stacking in a moist climate where the hay rapidly deteriorates. In the southern part, many of the cows are fed nothing but hay or straw through the winter. As the supply of these is often limited, spring finds many of the cows so badly emaciated and in so weak a condition that they can scarcely get up alone, and it takes a month of fine pasture in the spring to put them in good condition to produce milk. This reduces the portion of the year when the cows are producing anything like their maximum yield to about three or four months, which means that the earning power of the farm is run at full capacity for only one-third of the time, and for the remaining portion of the year not only the stock, but the labor, as well, is partially or wholly idle. There is certainly little profit in this sort of dairying, and its effects are detrimental to both man and beast. To add to their folly, they attempt to make both milk and beef from the same cattle, which are frequently scrubs and good for neither purpose. Still, these are the conditions existing in a large and exclusively milk producing district of Ireland, where the cattle are decendants from the native stock which have been crossed with the Short Horns for many years, and bred for beef and milk, until now they are almost a distinct breed.

Irish farmer's cottage.

The great problem is how to supply winter butter and keep the

English trade the year round. Co-operative creameries are doing much to aid in this respect. Still, the majority of farmers persist in the "one-third year dairying" method. There are some good dairymen, yet the poor ones do not learn to profit by these examples and each year the pastures are consumed with but comparatively small profit. Many Irish dairymen, like so many American dairymen, do things the easiest way, and in consequence reap the small end of the profit.

Irish laborer's cottage.

Notwithstanding the bad practices followed, Ireland has 800 creameries and exports about 140,000,000 pounds of butter a year, which is valued at over $30,000,000. If Ireland could be awakened to her natural advantages, breed efficient dairy cows and feed and care for them properly, she could easily be a great dairy country. Denmark—only one-third the size, and lacking the natural advantages of soil and climate,—exports over twice as much butter.

Irish cow market, Dublin.

Like many Americans, the Irish dairyman is so exceedingly short-sighted that he cannot see that an extra yield of 2,000 pounds of milk, worth $25 a year, in a single year will alone more than make up the difference in the butcher's price between a special dairy cow and a dual purpose cow at the end of her lifetime.

The slack methods followed by many dairymen in some parts of Illinois are but little better than those in Ireland, and without improvement it must follow that we have a class of dairymen who are merely existing in a country where the land is fertile and the market for high grade dairy products good.

SCOTLAND.

The dairy region of Scotland is confined almost exclusively to the southern part of the country, and this is the only section that will be discussed. The general appearance of the country is much the same as that of England, the larger portion being in grass, either pasture or meadow, and the crops grown are also similar. It seems like a mistake to till so little of the land, when compared with the more intensive methods of Denmark, where nearly all of the land is under cultivation. Yet the grass grows so luxuriently that it gives a fair return per acre.

At the edge of the village of Fenwick, Scotland.

FARM MANAGEMENT.

The usual rotation is oats, oats, hay, hay, pasture for from five to nine years. The methods of seeding, caring for the pastures, and harvesting are much the same as have been described under England. The farms vary in size from 60 to 300 acres, and some are as large as 1,000 acres, but the average is about 100 acres. On a good farm of this size are usually kept 24 cows, 7 or 8 two-year-old heifers, 7 or 8 yearling heifers and the same number of calves. Most of the farms are rented. The rent varies according to the productiveness of the land, and averages $7.50 an acre. As a rule, land valuation is not increasing. In some sections land is decreasing in productiveness because less money is spent in keeping up tile drains, and on account of lax methods of farming, one of the reasons for the latter being the lack of laws protecting the tenant farmer from the unscrupulous methods of the landlord. The present laws seem to put a premium on poor farming, for if a tenant improves his farm, making it more productive, he is almost sure to have his rent raised at the expiration of the lease, and this all tenants very much dread. As a rule, a tenant stays on the same farm for a long number of years, and occasionally a line of tenants remain on the same place for one or two centuries. Land has been known to change hands three times, yet the same line of tenants remain on the farm.

Curing hay. When dry the cocks are pitched into the small stacks and after about three weeks these are taken to the barn.

Broad, rolling pastures of Scotland. Ayrshire heifers in foreground.

Scotch dairymen say that the size of the farm most profitable is one which can be run by the family, without hired help, which is often expensive and inefficient. Married men get $225 a year, with house and potatoes furnished. Single men receive from $175 to $190 and board.

DAIRY CATTLE.

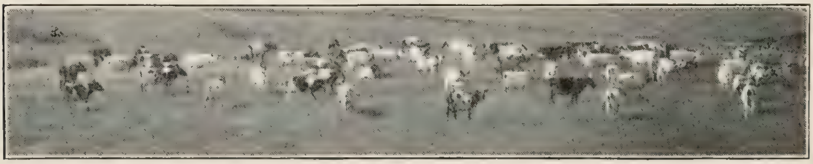
In this section of Scotland dairying is almost the sole occupation of the farmers. The cows kept are practically all high grade or purebred Ayrshires, and as a class are efficient and economic producers. Heifer calves from the best cows are raised on all the farms. A good registered Ayrshire cow brings from $125 to $200 and a good grade cow $80 to $100. Heifers drop their first calf at from 2½ to 3 years of age. The cows that are good producers are kept as long as they are healthy. The poor milkers are disposed of while young, on the dairy market, to other dairymen, or fed for beef. In many herds in Scotland are cows twenty years old, and still good producers, but in herds which are fed heavily on grain they do not last as long, and the oldest cow is not more than twelve years old. As a rule, the sires used are from high producing dams, rather than show stock. On farms where milk is sold for direct consumption the cows are usually dry for six weeks, and on farms where cheese is made, the cows are frequently dry for three months during the winter. The best dairymen expect to receive $100 per cow per year, when the milk is sold at an average price of $1.40 per 100 pounds. To show the efficiency of the Ayrshire cows it is only necessary to state that the production on 18 farms near Kilmarnock in 1907 reached the high average of 6,920 pounds of 3.9 per cent. milk per cow, including heifers with their first calf. In comparing the yield of the Ayrshire cows in Scotland with the cows in the United States, consideration must be given to the fact that the cows in Scotland are fed very little grain.

A typical scene in Ayrshire.

About one-half of the cows in Scotland are milked by women and girls, and the average is eight cows to the milker. Cows are milked regularly twice a day, and in most herds the milkers are rotated around the herd in a regular order, so that a cow is not milked twice in succession by the same person. This is the universal practice followed in Scotland, the explanation of it being that if there are any poor milkers, they will not spoil a given number of individual cows. In this particular, Scotland is unique, as in all other dairy countries visited, each milker milks the same cows regularly. Scotch dairymen admit that if all the milkers are good, it is best to have them milk the same cows regularly, but if some of the milkers are poor, it is best to rotate them in this manner.

Ayrshires, the dairy cow of Scotland.

There are two types of Ayrshires in Scotland; the show type and the producing type. The show type has been developed for the show ring, and bred for beauty alone. The genuine show udder must be compact and closely attached, both before and behind. The sole must be flat, with no indentations between the teats, and the udder must not protrude behind, but be carried up even with the thighs, and have small cylindrical teats, evenly placed on the flat bottom. This is the only kind of udder that can be shown many years in succession and not become too pendent for the show ring. Any intelligent dairyman knows that this type of udder is fleshy and does not belong to the best producers. This craze for tight, close, shallow udders started in the show ring about twenty-five years ago. It has been of untold damage to the Ayrshire breed, and has split the breeders into two factions—one of which is breeding for show, and the other for production. The breeders who are breeding for production belong to test associations and keep accurate records of their cows. The latter cows have good udders that milk well away, and large, soft teats that are easily milked. One of the best authorities in Scotland upon this subject says: "The show ring has been a curse to the Ayrshire breed. Ayrshires would be a different



Ayrshires waiting for the milking hour.

breed today had there never been a show. The leading exhibitors of show Ayrshires of the flat, fleshy udder type have not made money, even if they have sold their stock at large prices, because they did not get enough milk to bring up the profits. One of the leading exhibition herds produced only half as much per cow as did another herd bred for production alone. This shows the folly of running to fads. You American dairymen are making a great mistake in allowing showmen to be your importers, as they are taking over only the show type. By this means you are losing, to the American Ayrshire, the advantages of our record Ayrshires in the economy of milk production.''

Ayrshire calves at feeding time.

As an illustration that show Ayrshires are not producers, the ring of aged cows at the Royal Agricultural Show last year is a good illustration. The cows placed at the lower end of the show ring were at the head in the production class. They stood as follows:

Inspection class	1, 2, 3, 4, 5.
Production on yield of milk............	5, 4, 1.

The cows receiving 2 and 3 in the inspection class were not shown in the production class.

Promising young Ayrshires.

Record Ayrshires are gaining rapidly in popularity. At the Highland Show Ayrshire cows must produce, the night and morning before the exhibition, 36 pounds of milk, or they are not eligible to enter the show ring. This has the advantage of preventing the cows being bagged before showing. To prevent fraud in all competitions, cows are milked out in the open. Foolish fads are gradually passing away, and at the present time color does not count for much in the Ayrshire show ring in Great Britain.

FEED AND CARE.

The cows are usually given nothing but pasture during the summer from May 10 until September. After this they get the aftermath in the meadows, which keeps them until about November 1. Soiling crops are not fed, excepting some cabbage in the fall. The amount of pasture required per cow for the summer will vary from one and one-half to three acres, depending upon the land. During the winter, dry cows are fed some roots, and all the straw they will eat, but no hay or grain. Cows giving milk usually receive about 12 pounds of straw, 6 pounds of hay and some grain—the amount varying greatly, depending upon the production of the cow. The Scotchman feeds his good producers well, but does not waste grain on dry cows or those giving a small amount of milk. As a rule, the grain consists of bean meal, Indian corn meal, oil cake, bran and dried brewers' grains. The cows are turned out each day for a half hour during the winter to drink from a pond, stream or trough. They are given warm slop in the stable at mid-day.

Milking time in a Scotch stable. Receiving pails in foreground.

Calves are never allowed to suckle their dams, but are fed whole milk for six weeks, then skim milk or whey, with an addition of oil cake until they are five months old. After this they are given nothing but good pasture, when it is available. Yearling heifers are maintained exclusively on pasture during the summer, and in the winter they are given oat straw with 2 pounds of cake per day, or hay and no cake.

FARM BUILDINGS.

The buildings on the farms are usually made of stone, with slate roofs. These are naturally substantially built, and many of them last for more than a century. The buildings are usually placed around an open court,—

Buildings of a Scotch farmer. House in center, cow barn on right, and tool shed on left, forming a court in center.

the house on one side, with the cheese room and cow stable forming the side adjacent to the house, and connected with it. The hay barn forms another side, usually connected with the cow stable, and the horse barn and tool shed are on the fourth side.

Dairy barn and hay barracks on a farm in Scotland.

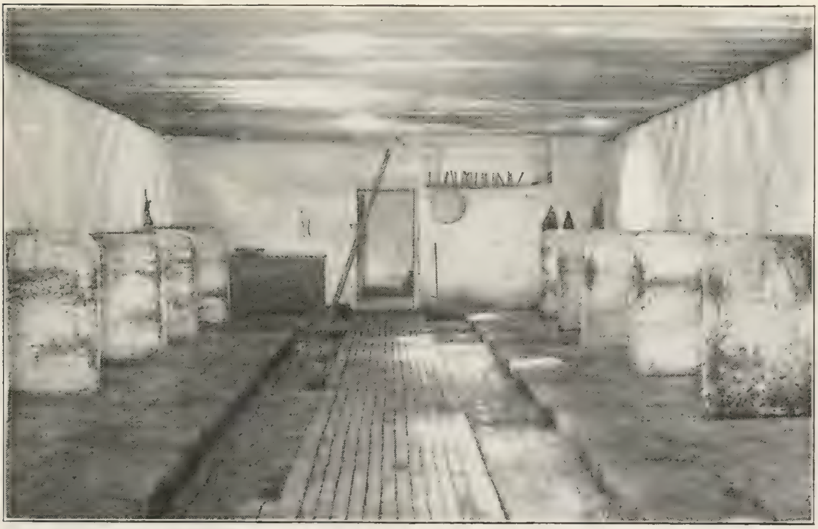
The cow stable is always one story, with both windows and ventilators in the roof. The stalls are double and the cows head directly against the wall, with no feed alley in front. The floor is of cement or brick, and the whole stable is exceptionally clean and sanitary. The sides and stalls are kept neatly whitewashed and the floor is scrubbed every day. These are the conditions on the average cheese farm in Scotland.

CITY MILK SUPPLY.

The method of supplying milk to the cities and towns in Scotland is much the same as that of England, which has already been described.

MANUFACTURED PRODUCTS.

Most of the milk not used for direct consumption is manufactured into Cheddar or Cheshire cheese, and this is almost universally done on the farm. While this necessarily involves more labor than when



Interior of cow stable. Double stalls divided by glazed tile partition. The floor is paved with brick, and is scrubbed daily.

made in factories, on the whole a better quality of cheese is secured, and the extra price received, more than pays for the increased labor involved.

A cheese making room, always having a cement floor, an abundance of light, and kept in a clean and sanitary manner, is usually close to the cow stable. In this room are to be found all necessary utensils and equipment for making cheese. The cheese is sold, wholesale, for about sixty shillings per hundred weight, which is $15 per 112 pounds, or 13 1-3 cents per pound.

Comparatively little butter is made in Scotland.

Factory where the milk on a large farm is made into cheese. Curing room above. Note substantial construction of building, and ventilators on roof. Scotland.

HIGH POINTS IN SCOTCH DAIRYING.

For the American dairyman, the striking features of Scotch dairying are the uniformly good cows kept, the excellent care given them, and the attention paid to feeding them economically on a small amount of grain, never wasting concentrates on cows that are not producing heavily.

To the Ayrshire and dairy interests of America, it is imperative that the Ayrshires imported be not of the show type, but the magnificent producing record Ayrshires so often seen in Scotland. When we consider the low efficiency of the average cows milked in America, com-

Buildings on an Ayrshire dairy farm. In this case the stabling forms the square court and the house is outside, but adjacent.

pared with the average Ayrshires milked in Scotland, it is easy to see the great possibilities yet unattained by the dairymen in this country.

A laborer's cottage, Scotland.

To the American cheese maker, the excellence of Scotch cheese is well known, yet the secret of the success in making cheese of such a high quality lies not so much in the skill of the cheese maker as it does in the care taken of the cows, stable, cheese room and utensils, thus keeping the milk clean so that it is delivered to the cheese vat in almost perfect condition.

AGRICULTURAL SHOWS.

No discussion of dairying in the British Isles is complete without mentioning the influence of the agricultural shows.

Parade of dairy cattle, Bath and West Agricultural Show, England.

The British appreciate an agricultural exhibit as do no other people in the world, and if there is one thing they do know how to do better than another, it is to arrange and conduct such an exhibition in

Jerseys being judged. Ends of dairy sheds in background. Royal Agricultural Show, England.

a high class manner. Their shows are quite unlike American, and we can learn many valuable lessons from our British cousins in this particular. No horse races, side attractions or catchpenny schemes of any kind are allowed on the grounds; the people attend to learn instead of to be merely entertained by some fake show, as is too frequently the case in this country. Another most commendable feature is that everything is in readiness the morning of the first day. All exhibits must be up and completed the night before the show opens or leave the grounds at once. Coupled with this fact the judging begins early the first morning and is vigorously pushed, thus making the first day much the best of all, which is a great advantage, as it makes every day interesting and people are not obliged to wait until the last day to see how the ribbons are to be tied.

There are many smaller agricultural shows held in the different shires, but as they are quite similar, excepting in size, a description of the Royal, the Bath and West Agricultural Shows of England will suffice.

Ayrshires in show ring. Royal Agricultural Show, England.

The general scope of the work of the Royal Agricultural Society, under the auspices of which the Royal Show is held each year, is well summed up in the Society's motto: "Practice with Science." In England every one is interested in agriculture, from the King down to the lowliest laborer, and no man is considered well educated unless he possesses a reasonable knowledge of the subject. The entire royal family hold memberships in the Royal Agricultural Society.

Dairy Short-horns in milking contest. Royal Agricultural Show, England.

The most prominent farmers and breeders come together at this show to study the best specimens of live stock the country can produce and to exchange ideas as to the best methods of breeding, feeding and handling live stock. They also see the latest inventions and most improved implements and machines for doing all kinds of agricultural work. Some idea of the extent of this exhibition may be gained from the fact that the grounds cover 100 acres and the exhibits are placed close together. This show has not been permanently located, but has been moved each year, thus necessitating temporary buildings, which, however, are very comfortable. Owing to the vast amount of work to be done to get everything in readiness on grounds of this size, the work begins about six months prior to the show, and by the time the opening day arrives everything is completed.

The judging began the first morning at nine o'clock and was vigorously pushed, as may be imagined, when we consider that at the Royal there were about 700 entries of cattle, the same number of horses, and nearly as many of sheep and hogs, yet the judging was practically completed by noon the first day.

Guernsey stable. Royal Agricultural Show, England.

The dairy breeds were represented by Ayrshires, Jerseys, Guernseys and Kerreys, the Short Horns being exhibited as a strictly beef breed, the same as in this country. There was, however, an exhibit of unregistered dairy Short Horns. The cattle were paraded each morning in an immense ring, which was surrounded by a crowd of admiring spectators. In the afternoon the horses were paraded, and

One of the avenues in the dairy and farm machinery exhibit. Royal Agricultural Show, England.

later in the day judging of the harness classes took place. There were at all times large crowds around the show rings, stalls and pens. People came from all parts of the British Isles to attend this show, which lasted six days, and one day 52,000 people were admitted to the grounds. The amount of money offered in premiums was nine thousand nine hundred and sixty-nine pounds, or about $50,000, exclusive of the champion prizes, and many vauable medals offered by the different breed societies.

Besides live stock there was an extensive exhibit, numbering more than four hundred stands, of all kinds of agricultural and dairy implements and machinery, from small hand tools to harvesting and threshing outfits, and a large number of wagons and vehicles of all kinds and descriptions, consisting largely of carts, many of which were heavy and high.

Working dairy. Bath and West Agricultural Show, England.

The most attractive part of the dairy exhibit was the working dairy, which was located in a large building erected for the purpose and which accommodated forty hand churns and butter workers. In this building could be seen some kind of dairy work in progress at all times during the show. Separating, pasteurizing and cooling milk occupied the morning hours and later each day two butter-making competitions for prizes, by dairymaids, took place. These contests were well filled and revealed many excellent buttermakers. There was a milking contest, which was rather a novel feature and created a great deal of interest. Each contestant was required to milk three cows. Dealers in dairy apparatus and machinery had many fine stands. This was a most interesting part of the show, for both the separators and utensils used were quite different from ours.

It is difficult to describe an English show so that one who has not been in attendance can really appreciate its value, but a week's stay at the Royal Agricultural Show of England is well worth a trip across the Atlantic.

DAIRYING IN HOLLAND.

The time spent studying dairying in Holland was devoted to the richest and most intensive dairy regions, viz., the provinces of North Holland and Friesland, which take the lead in both quality and numbers of dairy cattle. It is to this section of the country that the following description is devoted.

Road on top of the dyke running around the Zuider Zee. The water in the sea on the right is 12 to 15 feet higher than the land on the left. Notice meadows dotted with cattle.

On the first visit we entered the country through the Maas river, and as we steamed slowly up for thirty miles to the city of Rotterdam we received our first impressions of Holland with its numerous canals, level fields and beautiful herds of dairy cattle. The richest and best agricultural sections of the country lie below the level of the sea and have been rescued from it by means of dikes, canals and windmills.

Sailing up the river we saw cows in the pastures and hay being made in the meadows several feet below the level of the river. Coming into port, after crossing the Zuider Zee, all that could be seen from the deck of the steamer was the roofs of the houses in the village. The whole country is a perfect network of canals and is thickly dotted with large, picturesque Dutch windmills. Near Zaandam sixty-five of these mills could be counted from the train window at one time. In many portions of the country the canals, which are from ten to twenty feet wide, are not more than ten rods apart. The water flows slowly along, being gradually pumped to higher levels by means of engines or large windmills, until, after passing for a long distance through large canals with immense dikes on either side, it finally reaches the sea.

Something of the energy of the Hollanders can be imagined by considering that all the country roads are either macadamized or paved with brick, and that all of the water has to be pumped out of the country and kept from one to two feet below the surface of the land. The ditches formed by this drainage system are divisions between the fields; making fences unnecessary excepting along railroads or to enclose small paddocks. A passage from one pasture to another is afforded by a bridge over the canal, or sometimes by filling in earth over large tile, so as not to obstruct the flow of water. Posts are set on either side and a gate closes the passage.

Windmill and engine house used for pumping water from canals into the Zuider Zee on right. A large storage reservoir extends from the mill beyond the engine house. This contains a reserve water supply, and in dry times can be let back into the canals if desired for irrigation purposes. Sea water cannot be used on account of the salt.

Holland contains but 8,000,000 acres, or less than one-fourth the area of Illinois, only one-third of which is really good land, as large tracts in the eastern part are merely peat or barren sand. This comparatively small area of land, equivalent to one-twelfth the area of Illinois, has developed important things, agriculturally. The size seems to be no hindrance to progress, as over five million inhabitants, noted for their thrift and cleanliness, make their living on this small area. Their exports are $14,520,000 worth of butter and $12,480,000 worth of cheese, making a total of $27,000,000 annually. At this rate, Illinois would have to export $108,000,000 of butter and cheese.

Most of the farms are owned by the men operating them. These energetic farmers keep their places in the best of condition, and drive to town in a substantial, well finished two-wheeled carriage, behind a sleek, chunky, active horse. A poor farmer is seldom found, as the life of the Hollander has been devoted to the one subject—dairying—and his education has been such as to make him appreciate the importance of thorough, careful methods. His children are well educated, and in some cases are sent to another country to complete their study of foreign language.

Rear view of farm buildings showing manure pile which is to be spread on the pasture in August.

From an agricultural standpoint, Holland is one of the most interesting dairy countries in the world. Though frequently ignored by tourists, it is full of interest, instructive sights, and quaint old customs.

Their conditions differ so markedly from ours in many respects that it is impossible for us to learn much from them that we can copy directly, yet there are many underlying principles which are worthy of our most careful study. The foresight shown by these people in providing permanent roads, buildings and equipment for their dairy work, and many of their cleanly methods, could well be studied and copied on this side of the Atlantic.

FARM MANAGEMENT.

There is little grain farming or mixed husbandry in Holland and almost no stock is to be seen excepting dairy cattle. Dairying is the principal occupation of the Dutch and the greater portion of the land is either in pasture or meadow. Milk production is practically a grass proposition. Plows and grain raising are almost unknown in the intensive dairy sections.

A familiar scene during summer in a Holland cow pasture.

The farms are much smaller than with us. They vary somewhat in size with the locality, but usually contain about twenty-five hectares, or sixty acres. On farms of this size the live stock will usually consist of about twenty-two cows, nine heifers, forty sheep, fifteen pigs and one or two horses. Of this land about ten hectares is devoted to meadow and the rest pastured, as dairying is conducted on a strictly grass basis. There is such an abundance of moisture that the grass grows very luxuriantly, and some seasons great difficulty is experienced in curing hay.

Early May sees the cows turned to pasture, and the method of feeding for six months is then very simple, as the cows only crop the grass in the pastures. It is rare to find a field larger than five acres, so the cows are easily restricted to a small area and are frequently changed from one pasture to another, so that the grass may be renewed in growth and freshness. A drought in July or August may cause a shortage of grass, and some oil cake may be fed, but as a rule the cows subsist for six months on grass alone. An exceedingly wet season causes the grass to grow in excess, and if it is too wet to be cured as hay it is cut and put in the ground or stacked and covered with mud for use as grass silage.

Gateway to a Holland pasture. The canals make fences unnecessary. The bridge over the canal is the usual communication afforded between pastures.

As the Dutch dairy farmer has nothing but grass, and no land to plow or crops to till, it would seem that he would have an easy time during the summer, but a closer acquaintance with his methods shows that this is not the case.

The pastures and meadows receive special care. Through the summer the pastures are gone over at frequent intervals and the cow droppings gathered with shovel and wheelbarrow and placed in piles, thus preventing the waste occasioned by fouling the grass, and the tufted appearance so often seen in our pastures. During the winter these droppings, having decomposed, are again spread upon the pasture. The fields are usually pastured one season and in meadow the next. The manure from the winter before has been carefully stacked and rotted, and the liquid confined in a cistern. In August this well rotted manure is hauled onto the pasture by means of a three-wheeled, one-horse wagon. The manure is put in piles of two to three hundred pounds each, 25 feet apart, making an application of from eight to ten tons per acre. These piles are later carefully and evenly spread over the land and after each pile is spread, the man goes over the ground, hitting the chunks a glancing blow with the fork so as to pulverize it all very thoroughly. Besides this, the cleanings from the canals, the mud and rank growth of soft reeds and water plants that are yearly removed when the sides of the canals are cut down, are placed in piles, and after they are thoroughly rotted are applied as fertilizers to the land.

Some meadows are cut twice in a season, and under ideal conditions it is not infrequent for the grass to grow as much as fifteen inches in a single month. Their method of handling hay seems crude, indeed, to an American farmer. The grass is cut with a scythe and raked by hand. The Dutch farmer claims it is cut closer and that less injury is done the soft sod by this method. When once begun, the mowing proceeds uninterruptedly, regardless of the weather. When partially dry the hay is put into small cocks and later, as the curing advances, these are piled into larger ones, and so on until it is sufficiently dry for the mow, when it is hauled to the barn in a one-horse wagon. It often happens that these piles are wet through by rain and have to be respread and dried, so that the hay may lose its greenish color and aroma, but mustiness or decay is never permitted, and the cows relish the hay as their winter ration.

DAIRY CATTLE.

One of the first things that attracts the attention of the traveler in Holland is the large number of fine black and white cattle. Thick as are the sheep on the Cheviot Hills of Scotland, even more numerous seem the black and white cattle on the level pastures of Holland. Everywhere, as far as the eye could reach, the landscape was thickly dotted with fine cows. A more beautiful dairy scene could scarcely be imagined. History tells us that for two thousand years the country now known as Holland has been famed for its cattle. For the last two or three centuries these cattle have possessed good dairy qualities, which have been gradually improved until we find today a breed of dairy cattle of a high order of excellence. Although only a small per cent. of the cows are registered, practically all look like pure-breds.

Importations of Holstein-Friesians to this country did not become frequent until about forty years ago, but they have spread rapidly, and at the present time are found in every state in the Union.

Successful dairying depends largely upon efficient cows, keeping them comfortable at all times by properly supplying their wants, and treating them kindly. In this particular the Dutch cannot be excelled.

In establishing so fine a breed of dairy cattle, they owe their success, in no small degree, to the careful selection of their breeding stock. Only a few of the choicest bulls are kept for sires and the greatest care is also exercised in selecting females. The cows, as a rule, are excellent individuals—a threefold method of selection being employed: first, in the sire; second, in the young calf, judged largely by the milking qualities of the dam; and lastly, the greatest of all tests is applied—performance at the pail. Not till the cow answers this satisfactorily is she accorded a permanent place in the dairy.

Milking time in Holland.

In America nothing but black and white Holsteins are eligible to registry, and red and white are met with only occasionally, while in Holland the red and white are seen in all parts of the country. In the province of Friesland are three men who are breeding nothing but red and white Holstein-Friesians.

One of the most interesting features of the trip through Holland was a visit to the farm of Mr. Kuperus. For many years this gentleman has been one of the largest exporters of Holstein-Friesian cattle to the United States and elsewhere. He has an exceptionally fine herd of dairy cattle and keeps a careful record of each cow in the herd by testing the milk every two weeks. The average yield of thirty of his best cows for one year was 11,275 pounds of milk and 394 pounds of butter fat. The average lactation period was 306 days and no cow was milked more than one year. His best cow gave, in 329 days, 18,986 pounds of milk and 585 pounds of butter fat. He has one cow with an average test for the year of 3.89 per cent. butter fat. This shows something of the character of the cattle that Mr. Kuperus is breeding, and it is not strange that he has won many prizes at the different agricultural shows where he has exhibited.

The cows are brought into a small pasture at milking time. As soon as drawn, the milk is transported to the cheese factory in the cans on the dog cart at the gate.

At the present time there are over 250,000 cows in Friesland, 15,000 of which are registered. Test associations started in the province of Friesland eight years ago, and today there are over two hundred of these associations, having twelve members each.

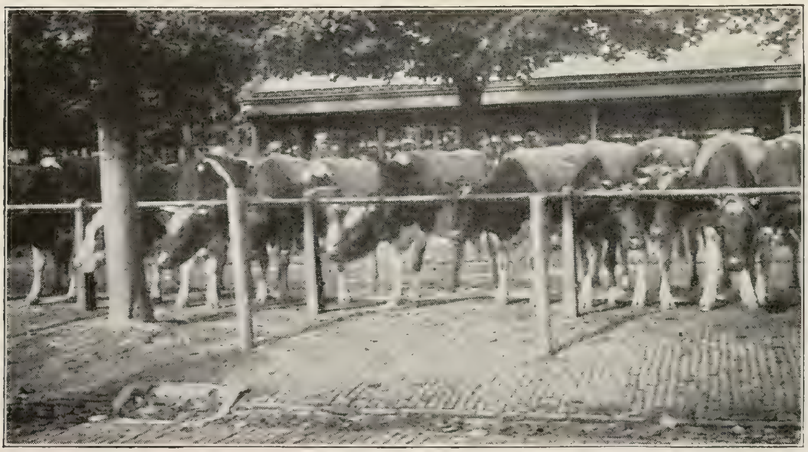
Cattle markets are held once a week in many of the towns. One section of the market is devoted to discarded dairy cows which are sold for beef. Another section is devoted to springers and cows in milk, which are to be sold to dairymen in South Holland. The cows sold on these markets are usually of an inferior quality. At Leeuwarden there was a large market for heifer calves, which go to South Holland to be raised, and later many are sold from there to Belgium for milk and beef. Registered cows of good quality are worth from $120 to $200.

FEED AND CARE.

The cows are turned to pasture about May first. During the cold, damp days of early spring the cows wear blankets in the pasture to protect them from the weather. At milking time they are not driven to the barn, but are milked in the pasture, or a paddock, and the milk brought back with a horse or dogs and cart. At the approach of the cold winds of November the cattle are taken from the pastures and put into the stable and not let out again until the following spring.

Calf market, Leeuwarden, Holland.

The feeding is done by the farmer, and all the feed, and many times the water, is carried in between the cows from the rear. The winter grain consists almost entirely of oil cake, fed only to the heavy milkers in quantities of from two to four pounds a day. The principal feed, however, is hay, each cow receiving nearly thirty pounds daily. It takes the great capacity of these cows to handle such a large quantity of roughage, and special care is taken to see that they are always ready for their feed. The cows are given the best of care. They



"Beast Market," Leeuwarden, Holland, where hundreds of farmers, in their long blue frocks and wooden shoes, gather one day each week.

are carefully curried and their tails suspended by a string from the ceiling, so that while the animal has free use of its tail, it can never get into the gutter to be fouled. Scarcely an hour passes, day or night, that the cows are not visited by an attendant. They are watered, fed and milked with the greatest regularity, and given every comfort possible.

NIJVERHEID II

Market day in Leeuwarden, Holland. A boat being loaded with cows.

Caring for the cows, gathering food for them, and the manufacture and sale of the product occupies the attention of the Hollander to a degree difficult to undertand unless one has paid them a visit. Holland is often called the cow's paradise, and it well deserves the name.

HOLLAND COW STABLES.

. It is not easy for a stranger to gain access to a Holland home, but it was our good fortune on both visits to Holland, in company with in-

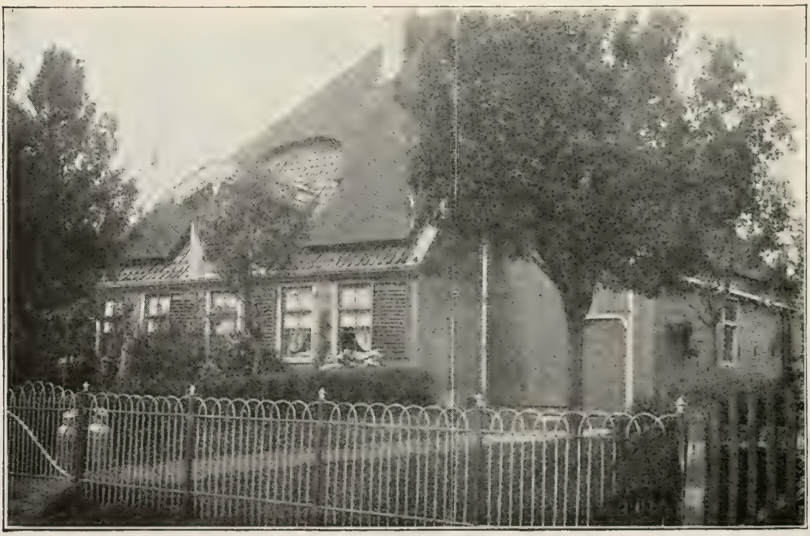
Typical Holland farm home.

terpreters who were acquainted in the vicinity, to get inside of many farm homes in North Holland, where the house and stable are under one roof. These homes are models of neatness, and are interesting in the extreme. The buildings are commodious, the roof steep and the eaves rather low, usually not over ten feet from the ground. The walls are built of stone or brick and the roof covered with an ingenious arrangement of tile and thatch, giving the building a substantial and artistic appearance. The one building contains the cow stalls, wagon shed, hay loft and living apartments.

Showing the usual location of a Holland home. The bridge affording a communication between the road and house, is closed in the middle with a gate.

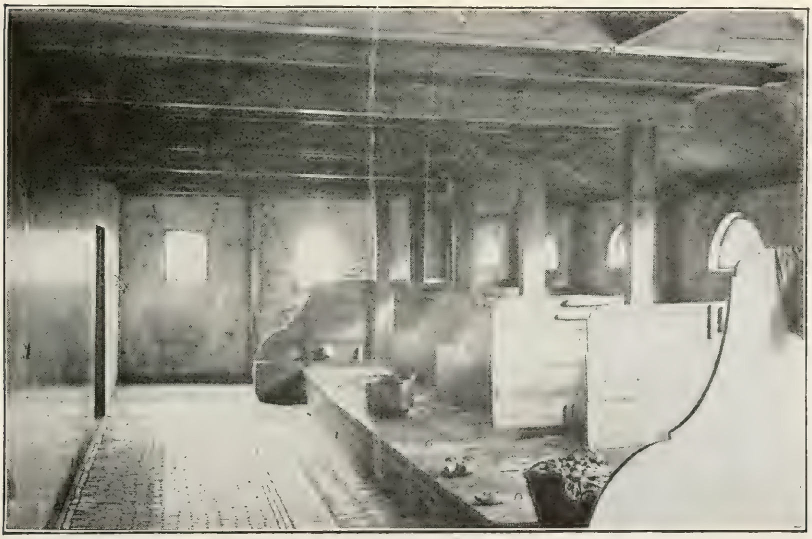
The houses are usually richly and artistically furnished—much better taste being displayed than is often seen in America. The furniture is of good quality and many times some finely carved old pieces are seen. The Dutch love music, and a piano is not infrequently a part of the household equipment.

The stables are as different from what we are accustomed to in America as one can well imagine. A cow stable in America is usually



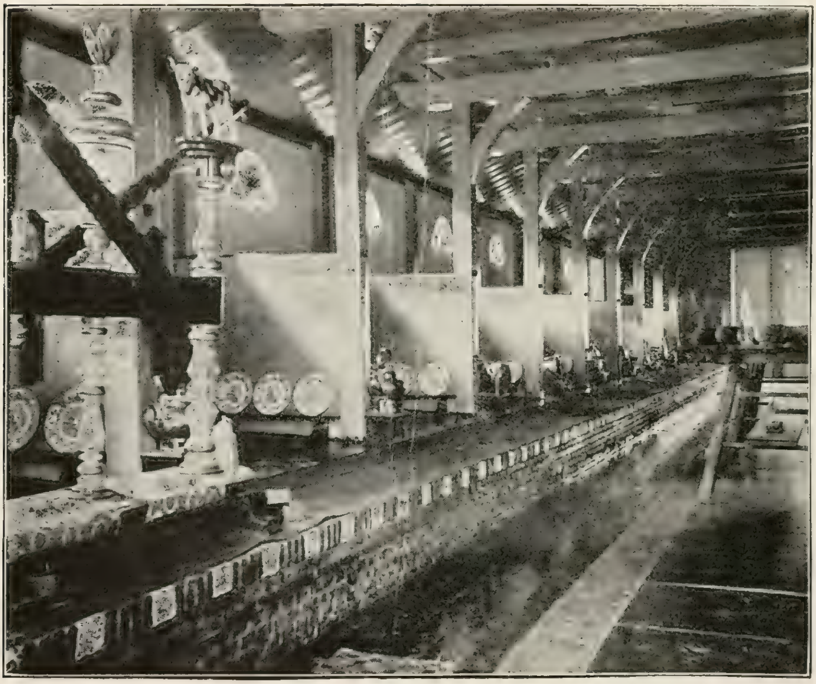
Farm home. House and cow stable under one roof. Double doors in barn. Windows in parlor.

an untidy, uninviting, and in many cases, absolutely filthy place where, to the disgrace of civilization, human food is produced. In Holland a cow stable is as clean and carefully cared for as any other room in the house. The Holland cow stable usually contains from twelve to sixteen double stalls, the floor of which is raised about eighteen inches. In one stable this portion of the floor was covered during the summer with small white sea shells; in another it was covered with matting, while the floor behind the stalls was of polished stone. The woodwork in all of the stables was neatly painted a bright blue. Some are elaborately appointed. On the floor of one stable, around each stall was a row of China plates, and at the end of each division between the stalls was a milk stool on which rested a plate. In one stable a polished copper teakettle occupied the stool at each stall and the partitions between the stalls were covered with fine rugs. The small semi-circular windows in front were draped with lace curtains. In one end of this room was exhibited a fine specimen of wood carving. The family frequently occupies a portion of the stable itself. In several instances the dining room was at one end of the stable and either a sewing room or kitchen at the other end. The parlor and other living rooms are separated from the cow stable by a single partition.



A tenant farmer's cow stable in Holland. Note the raised platform and double cow stalls with windows in front.

When winter comes the plates, shells and carpets are removed. The cows are arranged in the stalls so that the largest ones are in the center, thus giving the herd a more uniform appearance and causing them to make a more pleasing impression upon a prospective buyer. Since so many of the cows are sold for dairy purposes, this is a rather important item in the dairy management. Long and short cows are lined on the gutter by means of a double tie, the usual rope from the horns being fastened to one side of the stall and a trace chain attached to a wood or iron yoke about the cow's neck is brought back and hooked over a staple in the floor back of the stall partition, thus preventing her moving forward. A backward step would put the cow in the gutter, and as its bottom is about three feet below the stall floor, one step over the edge is usually sufficient to cause the cow to remember the occurrence and recover herself on the slip edge that protrudes some four inches a little way below the platform on which she stands. This ledge is also used to support the portable approach used to span the gutter while placing the cows in the stalls.



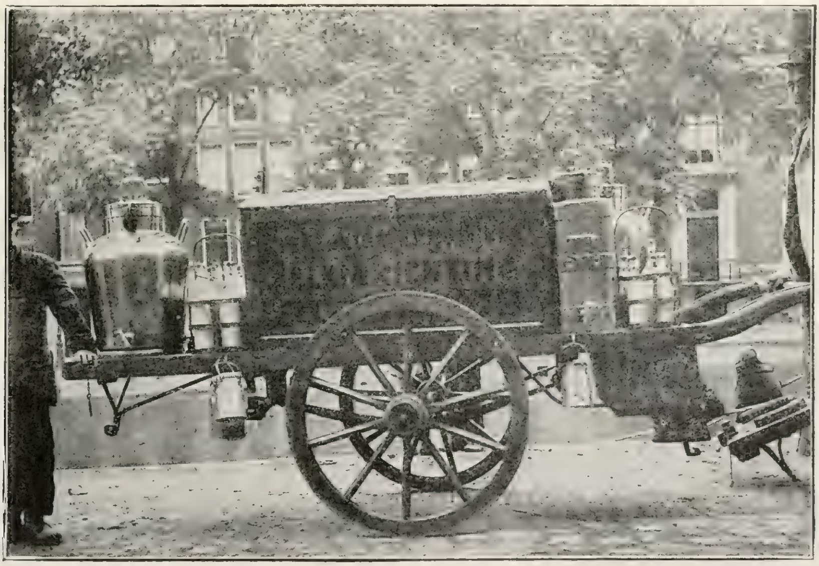
A well-to-do farmer's cow stable in Holland. Stalls for cows decorated with plates, copper tea kettles and wood carving. Lace curtains at windows. Edam cheese curing on table at right. This is the way the stable is furnished during summer months while cows are on pasture.

CITY MILK SUPPLY.

The greater part of the milk consumed in the large cities of Holland is distributed through central supply houses or milk depots. A visit was paid to one of these depots in Amsterdam, where over 16,000 pounds of milk were received and distributed daily. The milk is brought by wagons from farms eight or ten miles out, and by steam canal boat from a greater distance. It is brought in tin cans or wooden casks holding about six gallons.

Farm buildings in Friesland. House and barn not under the same roof but connected.

In Holland, as in all other European countries, they do not appreciate the advantage of thoroughly cooling the milk and holding it at a low temperature. In the smaller towns it is frequently delivered warm from the cow and is at best very improperly cooled in the large cities, thus necessitating frequent delivery, as the milk will remain sweet but a short time after reaching the customer. Nearly half the milk handled by this distributing house is delivered in long-necked, small-mouthed bottles. The greater part of the bottled milk is pasteurized. Milk is sold by measure and not by the amount of butter fat it contains, although objection is made if the butter fat falls below three per cent. The farmer receives $1.20 per 100 pounds for the milk. The price delivered to the customer


Milk delivery cart, Amsterdam. Bottled milk in box and in crates. Bulk milk in copper casks.

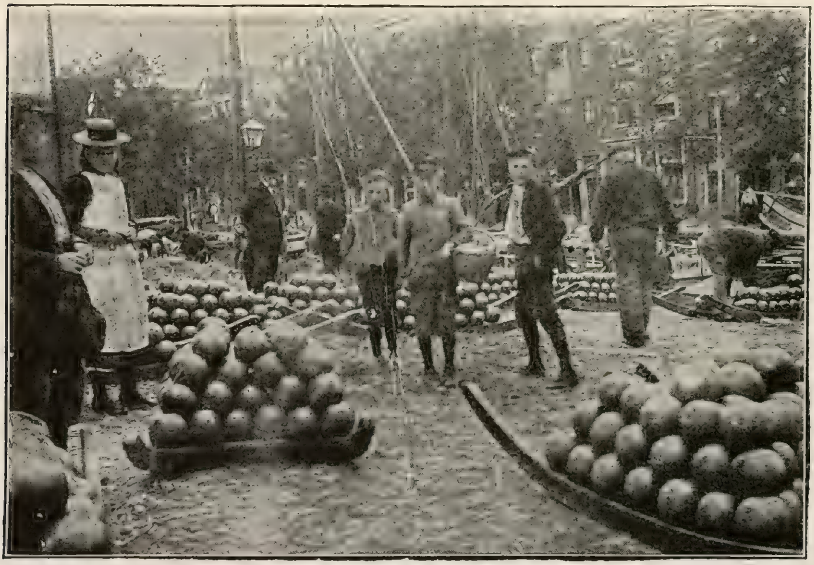
is four cents a quart for whole milk, two cents for skim milk and twenty-five cents for 25 per cent. cream.

All milk in Amsterdam is delivered by hand, either in a cart pushed by a man, or carried in pails with a yoke. The supply house which we visited, runs fifty delivery carts—a man and a boy going with each cart. The bottled milk is carried in a box in the middle of the cart, and usually on each end is a brass cask having copper hoops and handles. As the Hollanders pay much attention to appearance, these are kept highly polished. There are one hundred men and a large number of boys employed—the men receiving from fifty to ninety cents a day and the boys ten cents. The cheapness of labor accounts for the popularity of hand delivery.

Farmer's wagon delivering milk at distributing plant Amsterdam, Holland.

CHEESE AND BUTTER.

At Rotterdam we made a more familiar acquaintance with the chief product for which Holland is noted, namely, cheese. We paid a

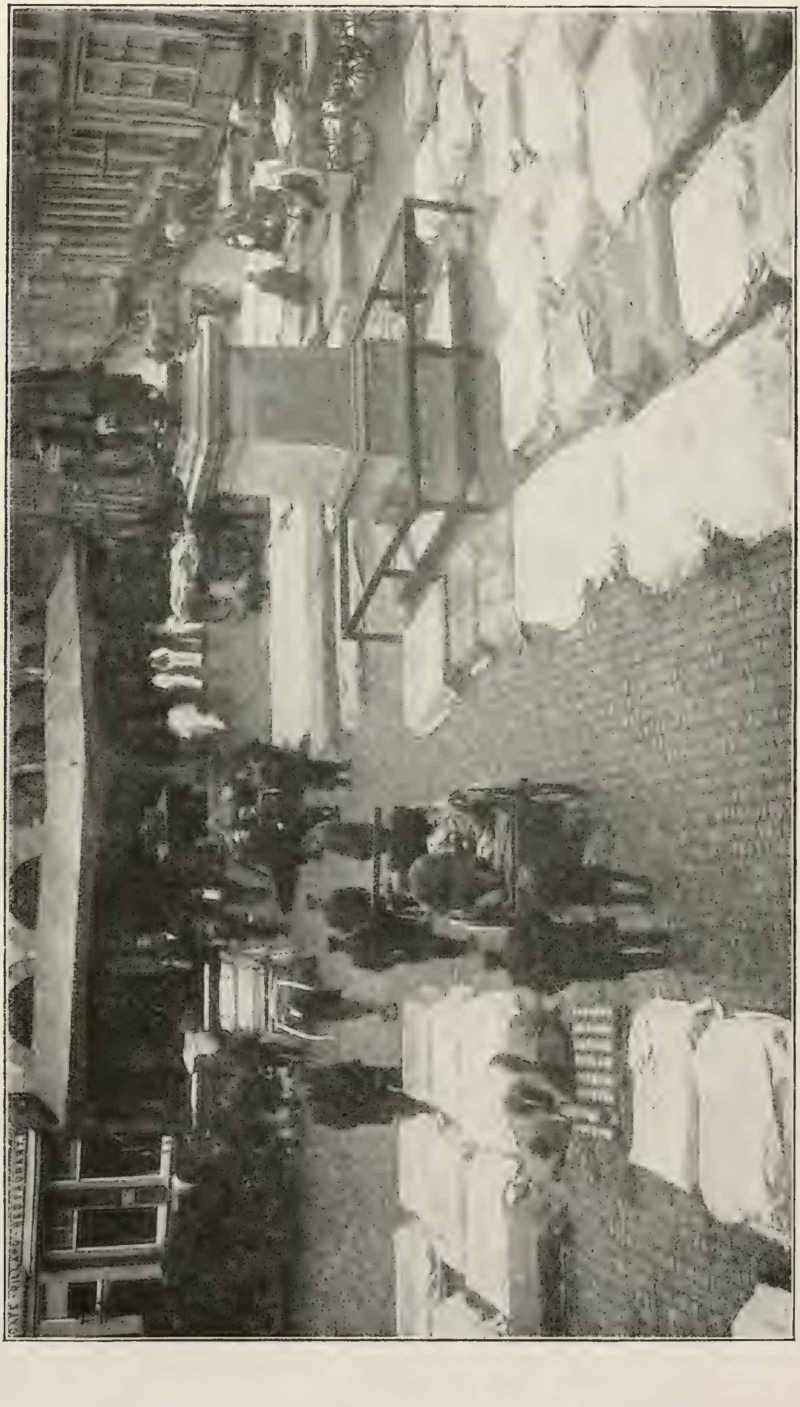


Cheese market, Alkmaar, Holland. Showing carriers on which cheese is transported from the market to the boats.

visit to the commission firm of Leaming & Sons, who are the largest cheese exporters in Holland. They have shelving capacity for 600 tons of Edam and Gouda cheese, these being the two varieties most commonly made in Holland. In the province of North Holland, Edams are made almost exclusively, and until recently were made in the farm dairies. During the last few years factories are coming in quite extensively. The Edam is the spherical variety, and when sold in America is stained red. In Holland they are left their natural color—a deep yellow—being stained only for export. The standard size is four pounds, but some are made as large as eight pounds. We saw one installment of Edams that was to be sent several hundred miles up the Amazon river, and each cheese was encased in a bladder. We were allowed to sample cheese of nearly every description; some were made to the queen's taste, and others so tough that it was difficult to get a trier into them. The price ranged according to the quality, varying from seven to twenty cents a pound.

Loading export butter and cheese on boats at the close of market-day in Leeuwarden, Holland.

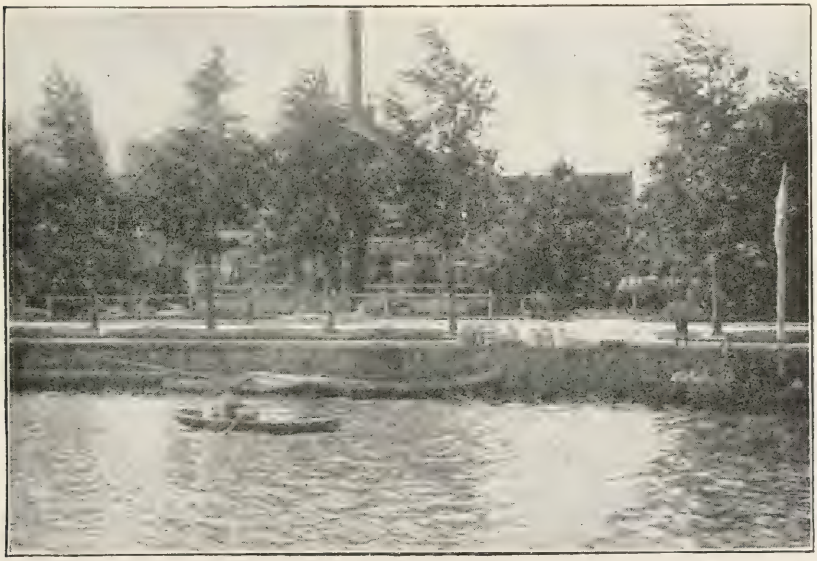
A cheese market is held one day each week in the towns and it was our privilege to visit the towns of Leeuwarden, Pemerand, Hoorn, and Alkmaar on market day. One of the largest markets is in the town of Alkmaar, and as these markets are quite similar, a description of this one, will suffice. The market consists of a government weigh house and a square black of pavement. On market day the farmers drive in early with the cheese they have made, pile them in neat piles on straw on the pavement and cover them with a canvas to protect them from the sun or rain. Cheese buyers, representing commission firms from the different part of the country, are present. Precisely at ten o'clock the



Cheese market, Hoorn, Government weigh house in distance.

gong sounds, the market opens, and the scene is a busy one. In about two hours we saw 60,000 cheese change hands. After being sold the cheese were removed on carriers, each borne by two men, to the official weigh house, where they are weighed and then packed into boats on the canal near by and taken to the different cities, or stored in large curing houses close by.

In the province of Friesland most of the butter and cheese is made in factories, practically all of which are co-operative. There are 70 co-operative factories that receive on the average 25,000 pounds of milk per day. The average price paid the farmer last year at these factories was 4¾ Dutch cents per lieter, or practically one dollar per 100 pounds. of milk. The butter sold on the average at 25 cents per pound and the cheese at 10 to 12 cents.



Delivering milk to co-operative creamery and cheese factory, Leeuwarden, Holland. This factory received milk from 2,000 cows. About one-third is delivered by boat on the canal and two-thirds by wagon.

Most of the butter exported from Friesland goes to England. It is put in wooden casks resembling a small barrel. Each cask of butter is numbered so it can be traced back to the creamery and to the churning from which it was made. The butter must contain less than 16 per cent. of water or the manufacturer is fined.

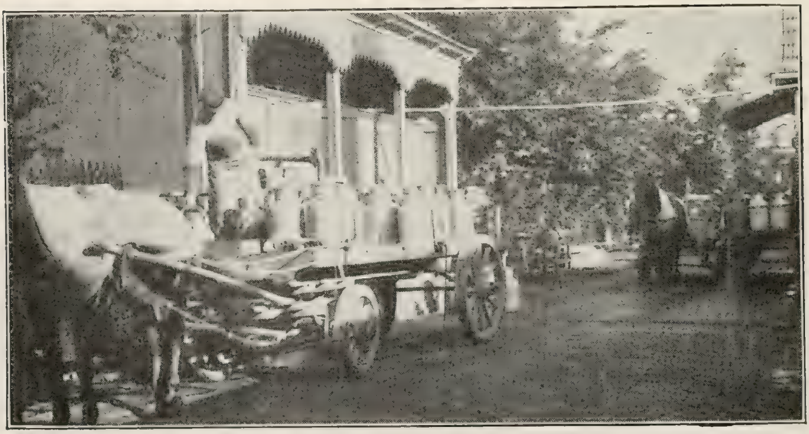
We visited a combined creamery and cheese factory near Leeuwarden that cost $50,000. This fine brick structure, with its slate roof, tile floors, whitewashed walls and ceiling, and everything built in the most sanitary manner possible, is in striking contrast with most of the cheaply constructed creameries and cheese factories in this country, with their soft wood floors, filthy sewers and general unsanitary conditions. This factory receives 50,000 pounds of milk a day in summer and 16,000 pounds in winter. It comes from 150 farms averaging ten cows each. The milk is delivered twice a day and paid for according to the amount of butter fat which it contains.

FEWER NATURAL ADVANTAGES THAN ILLINOIS.

The little country of Holland supports a population nearly twelve times as dense as that of Illinois, and exports an immense amount of butter and cheese, without the natural advantages enjoyed by the Central States. They do, however, have cheaper labor, and the milk flow is not reduced for three months during the summer by the cows being tormented with flies.

Milk hauler in Holland. One horse will haul two tons on the good, level road.

Here is a country where the land is worth from $500 to $1,000 an acre, and in many cases naturally no better than much of our Illinois land. Yet these people pay their rents or interest on the investment by producing



Creamery at Leeuwarden, Holland. Unloading at receiving room on right. Filling cans with skim milk on the left.

butter and cheese, which they place on the European markets in successful competition with that produced in America on land of less than one-fifth the value. They do this in spite of the fact that they cannot produce the amount of digestible nutrients per acre that we can with either corn or alfalfa.

The secret of their success is easily understood, and may be stated in a few words—efficient cows, excellent care, co-operation and superior quality of butter and cheese.

DAIRYING IN DENMARK.

Denmark is a country of small land holdings. The chief occupation of the Danes is dairying, and in wealth per capita, Denmark is next to Great Britain, but has the advantage of having this wealth distributed among the many. One-half of the two and one-half millions of people in Denmark are engaged in agriculture. These self-respecting farmers live in a style of refinement and comfort that is surprising. They are intelligent, industrious and honest, and their system of co-operation is based on these conditions. Their interests are those of a small nation given up largely to one occupation and one aim so that the difficulties of one are experienced by the many, and that which is beneficial to one is a benefit to the country as a whole.

It is important for the American dairyman to consider briefly the recent history of the agricultural conditions of Denmark and what has brought about the marvelous dairy development. After the Napoleonic wars the country was worn and wasted. When only partly recovered, the Prussian war of 1864 again brought great agricultural and commercial depression. At this time the chief agricultural pursuit was wheat raising, and it did not take the shrewd, far-seeing mind of the Dane long to discover that a continuance of wheat raising on the already worn and impoverished soil was not in accordance with sound, economic principle. Some radical changes in their general methods of farming were imperative if they were to prosper in any marked degree. It is because of these facts, coupled with their present prosperous conditions, that every American farmer should study what has taken place in Denmark, agriculturally, in the last forty years. Some of the factors that led to their success are here noted.

The history of the rise of dairying in Denmark is one of the most interesting and instructive chapters in agriculture. It is only a generation ago that the Danes changed from wheat raising to livestock, and the cows of the country were very inferior dairy animals, but by a course of careful, persistent and systematic selection and co-operation they have built up two strictly dairy breeds of a high order, and an efficient system of cropping adapted to the largest possible production of milk. To show what Denmark is producing it is only necessary to mention that she exports annually $87,000,000 worth of butter, bacon and eggs, nearly all of which go to Great Britain.

As a part of the general movement for reconstruction, the increase of the high schools and all other agencies of education formed no small part. The number of small holdings was also increased and a general system of co-operation started which was followed later by government assistance. Each community, with the help of its neighbors and the government, has worked out its own plan, based on the principles of economic production and co-operation. It is on these two principles that Danish agriculture is built. While the size of the country lends much to the possibility of a national system of co-operation, the fact that the United States is so large and has such varying aims and conditions, does not prevent the application of economic methods, nor does it in any way hinder the development of successfully planned community co-operative interests—interests which would greatly aid in the establishment of a uniform product, a dependable basis of supply, and constant markets.

FARM MANAGEMENT.

Lying as it does, with the narrow peninsula exposed to the cold north winds, and the islands in a land locked sea, Denmark exposes its area to varying climatic conditions and contains markedly different soils. Compared with the sandy lands of the northern peninsula, the warm, rich soils of the islands are much more productive and enjoy a longer season

A typical Danish farmer and his home.

of growth, calling for different management. It should be kept in mind that the country contains less than 15,000 square miles, or only one-fourth the area of Illinois. On the whole, the land is naturally poor and the climate not congenial. The country lies low and is either flat or undulating. The summers are comfortable, but so short and dry that oats have only time to mature and, of course, Indian corn cannot be raised. The cows have to be kept indoors more than half the year.

A large windmill for grinding grain.

The two significant and important factors in Danish agriculture are that ninety per cent. of the land is owned by the men operating it and the greater part of the country is under cultivation. The British farmer has sought economy in putting more land to grass and thus saving labor, while the Danish farmer has found success in the opposite direction. About the only resource of the Danes is their land, and although it is in many places poor by nature, they have made the most of it. Improved land laws and systems of land tenure, with education and co-operation, have gradually changed the agricultural conditions of Denmark from distress to prosperity. Large estates have been divided into small farms that are now tilled by their owners. The careless methods of former days have given place to an intensive and skillful dairying. The beef producing cattle have been displayed by dairy cows until they hold full sway on almost every farm and have brought success and prosperity to Denmark.

The farms vary in size from ten to three hundred acres, the average being about fifty acres. The whole country is given up to the most intensive methods of agriculture, about seventy per cent. of the farm land being under cultivation, and the thirty per cent., that is in grass, is not pastured. A seven year rotation is in general practice, as follows:

Danish farm cottages.

First year	Clover and grass
Second year	Clover and grass
Third year	Rye
Fourth year	Wheat
Fifth year	Roots
Sixth year	Barley
Seventh year	Oats

The land is in grass only two years. The first year it usually grows a strong crop of rye, grass and clover. Part of this is carted to the barn and fed to the cows green, part is eaten off by the cows being tethered on it, and the remainder is made into hay. The second year in grass, the land is treated the last of April or first of May with the liquid manure which every farmer carefully saves in a cistern. In this way they produce heavy crops of grass, for the first crop is generally good as a result of previous manuring.

A Danish farm house, with rose garden in front.

The rye is cut green for early soiling, and from this time until fall the cows are either soiled with green feed in the barn or tethered on it, or both.

The aim of the Danish farmer is to keep the largest number of efficient cows possible on a given area. On the large farms a cow is kept to about two and one-half acres, while on the smaller farms a cow is kept on even less area, as more intensive methods are practiced. In addition to this, enough young stock is raised to keep the herd supplied with cows.

From their feeding of cake and meal and the stall feeding of green crops, an immense amount of manure of fine quality is made, and with their careful methods of husbanding the solids in a covered manure pit and the liquids in a cistern, and applying in small quantities at frequent intervals during the rotation, the producing power of their land is increasing from year to year. This, again, increases the number of cows they are able to keep, and thus from year to year the country is becoming more productive and more dairy products are being made. But even the Danes have not yet realized the full possibilities of intensive dairying.

FARM BUILDINGS.

The arrangement of the buildings on the Danish farms is quite uniform. They are usually placed in a square around an open court. On the smaller farms the square is frequently incomplete, having buildings on only three sides, while on the smallest farms there are but two buildings, placed at right angles. When the buildings are in a square the house occupies the side of the court toward the road. Opposite this is the hay and straw barn. On one side of the court are the horse stable and cow stable, and on the other side the granary, storage for machinery, and the pig sty. In the central court, which is paved with stone, is frequently found a large Danish pump and a horse power for threshing and cutting hay or straw. Outside of this court, but adjacent to the stable, is usually the manure pit, which is walled up four feet on the sides and has an impervious bottom. Many times this has a roof to protect the manure from waste by rain. A cistern for liquid manure is near, and if the manure in the pit becomes too dry to decompose properly, the liquid is pumped onto it. On some of the large farms where the court has more size the manure pit is inside the court.

Old Danish farm house.

Corner of Danish court showing cottage and stable. Stork's nest on ridge of roof.

Danish buildings are constructed of stone or brick, and on the older ones the roof is of thatch, held on with cross sticks at the ridge. The buildings are kept whitewashed, and with their thatched roofs present a neat, tidy and artistic appearance. The barns are low at the eaves—not over eight to ten feet, and the height of the peak depends upon the width of the barn. This determines the size of the mow for storing hay over the cows.

A large Danish barn.

The cow stable is universally built with a feed alley in front of the cows. In some of the stables the cows head toward the center, and in others they head toward the wall, but are never placed against the wall with no feed alley in front, as in Scotland and Holland. The floors of the older barns are of cobble stones, but in the more recently constructed ones they are of cement. The cows are fastened with a rope around the neck, rods extending from a swivel on this rope below the neck to a perpendicular rod fifteen inches long fastened to a post at either side, giving the cow a considerable amount of freedom with her head. The platform on which the cows stand slopes gently toward the gutter, the latter being about nine inches deep and eighteen inches wide, and connected with the liquid manure cistern.

House on large Danish farm.

Stable corner of court. Danish pump in center. Horse power on right.

The houses are neat, attractive

and homelike, with frequently a fine rose garden in front and large trees to furnish shade.

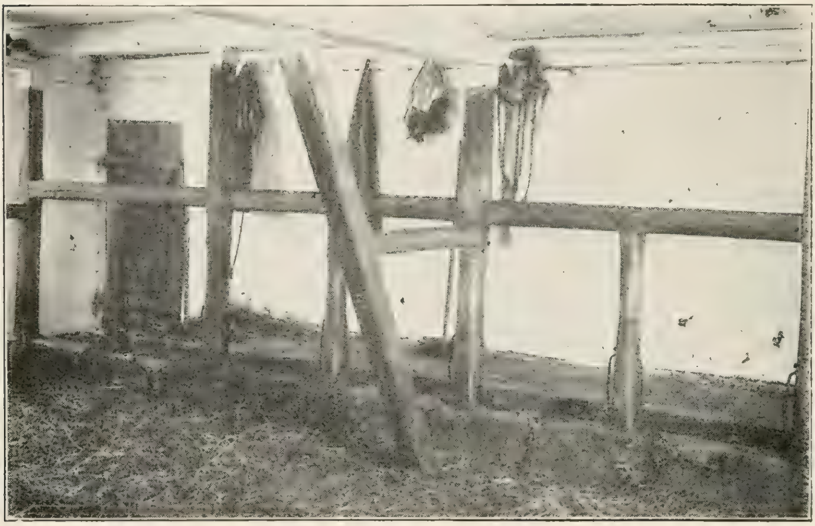
Interior of court on large farm. Dairy on right. Cow stable on left.

DAIRY CATTLE.

The million dairy cows of Denmark are confined almost exclusively to two breeds—the Danish Red, of Zealand and the islands, and the Jyske, or Black and White cow of Jutland. Both of these have been developed within the last thirty-five years from the native stock of the country, by careful selection for milk production. The Red cow is a product of a cross of Schleswig blood on the native rather scrubby cattle. The result is a race of fine dairy cattle, weighing from 1,000 to 1,100 pounds. They are dark red, with black muzzle, medium size, deep body,

Corner of court on a large dairy farm.

medium bone, fine skin and well developed udder and veins. The Black and Whites of Jutland have been developed from the beef breed in use in earlier times. They are a larger breed than the Red cow, resembling the Holstein-Freisians in color and size, but are shorter in leg and deeper in body than the Dutch cow. Both of these breeds have a distinctively dairy conformation and are good, economical producers.



Interior Danish cow stable.

The development of the breeds to such a high degree in twenty-five to thirty years has been due to the farmers' skill, intelligence and common sense in selecting and breeding for milk production alone, and the efficiency of these cows is a most striking exampe of what may be accomplished in a short time if good, systematic work is done and common sense and judgment are exercised. While many of the bulls used are young and untried, they are always individuals of merit and

Large herd of Danish red cows tethered in second crop clover, August 3.

from cows with large records. Only the best heifers are raised, and with the record of the dam and the qualities of the sire known, their selection is compartively simple, and better cows can be raised than can be bought on the open market. The price of cows is from $80 to $90, some of the best averaging as high as $100, so that it is also profitable from the financial standpoint to raise the young stock to replenish the herd. Heifers drop their first calf at from two to two and one-half years of age, and if they prove to be good producers, are usually kept in the dairy until twelve years old, when they are fattened for beef. In fairly good condition, cows bring 5½ cents per pound. Old, thin cows bring less.

The black and white cow common in Jutland. Herd tethered in distance.

Cows at tether. A typical scene on a Danish dairy farm.

FEED AND CARE.

The cows are treated with kindness, and every effort is made to have them comfortable at all times. On many farms the cows are regularly groomed. Tethering the cows on grass is usually commenced the fore part of May, for a portion of the day, at least.

The soiling crops used are rye, oats and peas, oats and vetch, and clover and grass. These are hauled to the barn and fed green, or pastured off by tethering the cows along the edge. In some sections where the farms are small all the land is under cultivation and the cows are kept in the barn until the oats and peas are nearly mature, when the cows are tethered on these during the month of July, after which they are too ripe to be well relished. The cows are then changed to the second crop of clover which by this time is from twelve to eighteen inches high. Some dairymen practice partial soiling all the time, cutting green rye the last of May, which was sown the previous September. When this rye becomes ripe in June, they feed clover, and when this is mature, about July 1, oats and peas are fed. After these, the second crop of clover is ready. It must be remembered that in the cool European countries it requires much more time for grain to ripen after it is fully headed than in the Central States, thus making the soiling season of the crop much longer. It is the general rule to pasture until short of grass, about July 1, and then soil until the grass is good again. The cows are left on pasture until October, the exact time depending upon the season, thus making the period cows receive green feed extend over nearly six months.

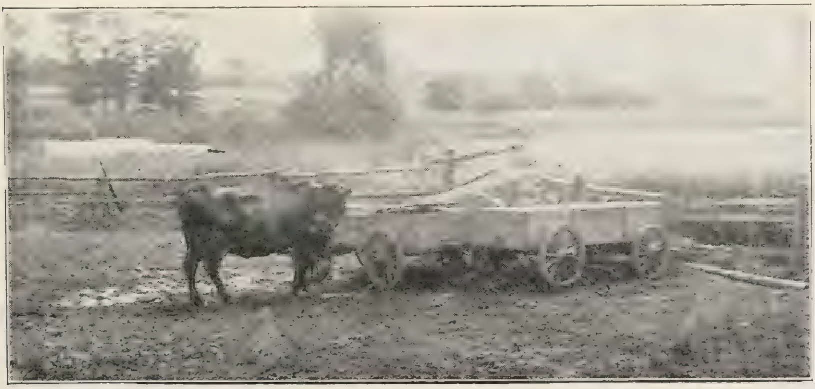
Tethered in plenty. Harvesting oats three feet high August 7.

Bringing tethered cows to stable at milking time. Field of roots in foreground.

The cows are seldom turned to pasture in Denmark, but tethered by means of a halter on the head and a rope or chain twelve to twenty feet long, which is attached to a ten-inch pin driven into the ground. The cows are moved, five times a day, from three to six feet, depending upon the amount of feed. In this manner the crops are grazed off without waste from tramping. The great advantage of this system of tethering is that the crops can be allowed to grow two or three feet high and yet be eaten down without wasting, thus producing much more feed per acre than can be grown on pasture that necessarily must be kept cropped fairly close. This is the Dane's chief point in the economy of feeding during the summer. Practically no grain is fed while cows are on grass. A few dairymen feed a little oil cake to their best milkers.

Calves tethered in clover.

The usual method of watering is to haul the water in a tank on a low-wheeled, one-horse wagon twice a day to the tethered cows. Doors are placed in the top of this tank at either end, and by proceeding directly across the field along the line of tethered cows, stopping the horse midway between the tether stakes, two cows can drink at the same time, making the task of watering easy. Some take the cows to the stable to be milked three times a day, and in this case the watering is done there. During the winter the cows are watered by pumping into the cement manger, or at an indoor watering tank.



Water supply for tethered cows. Instead of driving cows to water the Dane drives the water to the cows.

The cows are put into the stable in the fall and not let out again until the following spring. They are fed all the straw they will eat, and, on the average, 4 pounds of hay, 40 to 100 pounds of roots, and about 6 pounds of grain per day, consisting of oil cake, bran, barley and oats—the grain being fed according to the milk flow.

Milking in Denmark.

Many of the dairymen on the small farms milk three times a day, having ten cows to the milker. On the large farms they usually milk but twice a day having from fifteen to twenty cows to the milker, requiring two and one-half hours, night and morning, to do the milking.

The cows are allowed to go dry from six to eight weeks. To supply the Danish export trade of butter, an even flow of milk is required the year round, and most of the cows freshen from September to May. The male calves and any heifers not needed for future cows are sold for veal at from three to four weeks old. Calves are not allowed to suckle their dams. They are fed whole milk for the first week. After this it is gradually changed to skim milk and this is fed to the heifers until they are four to six months old. From this time on they are raised on pasture during the summer, and in winter are given hay, straw and roots, and sometimes a little oil cake.

COW TESTING ASSOCIATION.

Returning from milking cows at tether. Laborer's cottage in background.

The first co-operative cow testing association was organized in 1895. Later these proved so helpful a factor in weeding out the unprofitable cows, that they have increased rapidly, until at the present time there are about five hundred associations in operation. A man is employed by each association to visit the farms and do the testing every three weeks. He weighs the milk of each cow and keeps an accurate record of the feed consumed, so that at the close of the year the dairyman can determine the net profit per year from each individual cow, and which of his cows are the most efficient producers. By raising the future herd from the best cows the average production has been greatly increased, both in milk and butter fat, and, as would naturally be expected, the yield per one hundred feed units consumed is also greater. This system of feed and milk records has been a prime factor in improving the dairy cattle of Denmark to such a high degree in so few years.

CITY MILK SUPPLY.

The question of a pure milk supply for cities was first solved in Denmark when, about 1878, Mr. Busck, an able and philanthropic man, attempted to supply Copenhagen with absolutely reliable milk produced from cows warranted free from tuberculosis. He was assisted by a board of physicians, and established the basis on which the city is now supplied with milk as nearly perfect as can be obtained.

Town dairyman's house and cow stable.

The real problem of supplying a large city with milk occurs but a few times in Denmark, so that a brief description of the methods employed by the two large companies of Copenhagen will give an idea of the care taken to secure the proper results. These two companies handle over 100,000 pounds of milk a day, all of which is produced under veterinary inspection and in accordance with strict rules laid down by the company. Inspectors are employed, whose duty it is to see that every producer lives up to these rules, which require cleanliness at every step. As soon as drawn, the milk must be cooled and kept below 50 degrees F., until delivered at the bottling plant in Copenhagen. Here it is sampled and tasted—the slightest off flavor being sufficient to cause its refusal. After passing the inspector and weigh can it is pasteurized at 180 degrees F., cooled to below 50 de-

City milk delivery.

grees F., and put into small-necked bottles sealed with corks or expanded pulp covers.

Milk of different standards is sold, but each is distinctly marked with a label stating the quality and price. Milk sold in bulk is sent out in large sealed cans from which it may be drawn only through a faucet, over which must appear a statement of its quality. In this way skim, one-half skim, whole milk and cream may be put out by the same wagon at prices varying according to the quality without danger of the purchaser being defrauded. But all of this milk is of the same high standard from a sanitary standpoint, as it has all been produced under the same rules, which require the dairymen to provide healthy cows, clean barns and utensils, proper care and feed at all seasons, and, to insure proper cooling, thirty pounds of ice must be provided for every eleven gallons of milk produced.

Co-operative creamery.

This system of inspection and company control has been brought about largely through the guidance of the directors who, without remuneration or money interests, serve to see that the supply of milk is as nearly perfect as possible.

MANUFACTURED PRODUCTS.

In Denmark dairy manufactures are confined almost exclusively to the making of butter. The first co-operative creamery was started in 1863, but co-operative creameries were not generally successful until after 1880. It was about this time that the centrifugal cream separator came into practical use, and this gave creameries a special impetus and advantage. From this time the dairy industry grew with marvelous rapidity until for several years the production of milk and making it into butter in co-operative creameries has been the chief industry of the country. There are 1,100 co-operative and 300 private creameries in Denmark. These manufacture over 200,000,000 pounds of butter a year, eighty per cent. of which is exported to Great Britain.

Rear view Danish creamery. Milk cans on receiving platform at left.

The milk is hauled to the creameries in large milk wagons which pass along the main roads. Farmers living off these roads bring the milk to the hauler. Same farmers combine with their neighbors and haul the milk themselves. In summer the milk is delivered twice a day and in winter once. Stringent rules are laid down in regard to cooling the milk on the farm and in not mixing morning's and night's milk. All foods which may impart an objectionable flavor to the milk are forbidden. Milk from newly calved cows must not be sent to the cream-

Milk hauler.

ery until after the fifth day, and milk from diseased cows is prohibited. The creameries are compelled by law, to pasteurize all skim milk by heating to 180 degrees F. before it leaves the creamery, to prevent the spread of tuberculosis through this medium. Penalties are imposed for nonobservance of these rules, but the loyalty of the Danes to their own organization makes it rarely, if ever, necessary to inflict these penalties.

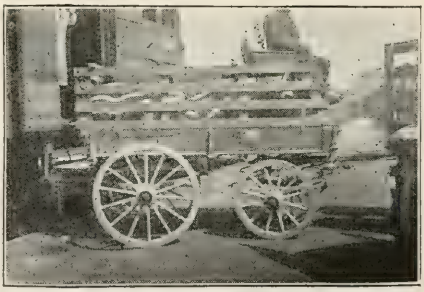
A mother of Danish bacon.

When the Danes decided to make butter for the English market, they, of course, had a large amount of skim milk as a by-product, and in looking for a way to get the most money out of this, they soon discovered that English bacon was selling at a high price, and at once set about converting their surplus skim milk into bacon hogs, and exporting bacon to England with the butter.

The creamery buildings are always sanitary and substantial, being constructed of brick, with slate roofs and cement or tile floors. They have a tidy appearance and are surrounded by a lawn kept neatly trimmed and planted with trees, shrubs and flowers.

The machinery used in the creameries is not as convenient or up-to-date as ours. Of the 1,400 creameries in Denmark, only 300 have the combined churn and worker—the remaining 1,100 using the old upright Danish churn and table worker. Many of the butter makers still use six or eight old fashioned shot gun cans in which to develop their starter.

The secret of the Danish butter makers' success lies largely in their habit of thoroughness. They first construct a sanitary building and then keep it clean by daily scrubbing. This applies equally well to all the machinery and apparatus in the creamery. In addition to this they have milk delivered to the creamery in almost ideal condition. Another secret of the Danish butter-makers' success is that they study their business thoroughly, becoming very proficient, as they expect to remain at this occupation for their life work. Because of this proficiency they turn out a product of



Danish farmer's wagon delivering bacon hogs at train.

uniformly high quality which is the chief factor in the success with an export trade.

WHAT WE MAY LEARN FROM DENMARK.

To show the marvelous recent development in Danish dairying it is only necessary to state that the receipts from cows at the present time are seventeen times what they were thirty years ago. From the million dairy cows of Denmark is exported 200,000,000 pounds of butter a year, worth $44,000,000. At this rate, Illinois, in proportion to her area, would have to export $176,000,000 worth of butter annually.

With all our boasting about rapid progress and a developed civilization in America, we are a slow people. The Danes owe their rapid rise and marvelous success as a dairy nation to the fact that they were alive to the demands of the markets of the world and strove to meet those offering the greatest remuneration. To secure and hold these, when a practice has been proved by economic value they do not waste a generation or two in adopting and putting it into general use.

A load of Danish butter for export to England.

The Danish dairyman understands that co-operation is one of the chief underlying principles for the highest success. This attitude is in striking contrast to that of the average American dairyman. Co-operative creameries are frequently pointed to in America as the only thing in which co-operation among farmers has been successful, yet most of our creameries in Illinois started co-operative, and in a few years either closed or changed to independent ownership. This shows in a most striking manner the lack of the co-operative, trustful spirit among American dairymen, which has proven of such great value to the dairymen of little Denmark.

The Danes have incorporated in their people the important knowledge that money is not the only thing in life, and that each man owes a duty to his fellows—that the interests of the community—yes, the nation—may prosper. This has yet to be instilled in the hearts of many Americans.

The Danes do not have as good a climate or soil as is enjoyed in the Central West. They have small patches of different crops, and cannot take advantage of four-horse teams; large implements and machinery, as can the Americans. They cut much grain by hand, and many of their methods are laborious.

The important question then is: How can the Dane afford to import and feed our corn and sell his butter in competition with us? He does this by being a close student of all the principles of dairying. He understands that dairying is an occupation requiring brains, thought and skill; that he must have efficient cows, economically fed and well cared for.

"When such a state of dairy intelligence as is found in Denmark exists among even the American farmers who pretend to be dairymen, there will be less wasting of years of weary unprofitable toil."—Hoard.

FINAL CONCLUSIONS.

It is the history of the world that it is not the largest nations that have done the really great things. In the dairy world it has remained for the little countries of Denmark and Holland to achieve the most enconomical production of high grade dairy products.

The production of clean milk is what every American dairyman must come to before we can hope to attain for our dairy products the high standard of execellence so conspicuous in the dairy products of Scotland, Holland and Denmark.

In general, European dairymen have learned most thoroughly that to make money in dairying the first essential is to eliminate every "star boarder" that pulls down the profits, and have a good herd—a herd in which every individual cow is an economical producer of a high order. They have also learned that these good cows must be well and economically fed and cared for.

The American dairymen should wake up to a full realization of his natural advantages in the cheap feed and good markets, and go at dairying in earnest, realizing that it requires brains, study and common sense to succeed. He should fit up convenient, substantial and permanent buildings and not shift from one phase of agriculture to another, but stay at dairying for a lifetime.

In no country does everything give place to dairying as it does in Denmark and Holland, and in no country in the world are the farmers so prosperous and self respecting.

There is no dairy country, though the land may be worth $1,000 an acre, that has the natural advantages for the production of dairy products enjoyed in the central part of the United States. None of the intensive dairy countries of Europe can produce and preserve in good condition for winter feeding of dairy cows the amount of digestible nutrients per acre that can be secured in the Central West with corn silage and alfalfa hay.

There must be great opportunities ahead of the American dairymen if Denmark can profitably feed our grain and maintain, through dairy exports, her place as one of the most thrifty nations of the world.

To embrace these opportunities, the American dairyman must realize that the four things practiced in Europe that make the difference between success and failure with the individual and that apply directly to the American dairyman are: a herd of efficient cows; economical feed and care; and clean methods.

ESSENTIALS TO SUCCESS WITH ALFALFA IN MISSOURI.

(Prof. M. F. Miller, Agricultural Experiment Station, Columbia, Mo.)

The Missouri Experiment Station has been conducting experiments with alfalfa on the various soils of the State for a number of years, and as a result of these experiments the following summary of the essentials to success may be given:

1. It takes good land to grow alfalfa without considerable care. Well drained creek and river bottoms, as well as all well drained and rich uplands, especially those containing plenty of lime, will grow it readily where it is properly handled. For average to thin lands much care is necessary to success. A stand may frequently be secured on average and even thin lands, but the yield is usually not sufficient to pay, and it is sooner or later taken by the summer grasses unless particular pains is taken to keep these out.

2. On rich lands alfalfa may be spring sown, but on average lands fall or late summer sowing is much better. From the middle of August to the middle of September is usually the best time for uplands in Central and North Missouri, but in the extreme southern part of the State it may frequently be sown as late as the first of October. Much depends upon the weather during August as to just what time it should be sown. Frequently the first of August is better than later

sowing, and very good returns have been gotten by sowing in July. From fifteen to twenty pounds per acre is the ordinary rate of seeding. Twenty pounds is usually best, unless the seed is very good and the ground is in very good condition. The seed is best broadcasted and lightly harrowed in, and a more even stand will be secured if one-half the seed is sown when the sower is walking north and south and the other half when walking east and west. The seed may also be drilled with a grain drill, using the grass seed spouts and running the seed through the hoes, but this is not ordinarily as satisfactory as broadcasting.

3. The seed bed must be well prepared. For spring seeding it should be plowed in the fall preferably, so as to allow it to be well settled below. This settling is very essential. It should be worked to an excellent seed bed on the surface. For fall sowing the land should be plowed early, preferably in June or July. It should be plowed deep and well settled below by thorough working. It should then be kept harrowed frequently to conserve the moisture and kill the weeds as they start until time to sow.

4. Inoculation on uplands which have never grown alfalfa before is beneficial and usually necessary to success. This is especially true of regions where sweet clover does not grow. Where sweet clover grows commonly, the land is usually inoculated for alfalfa. Bottom lands which overflow never need inoculating. Inoculation is best accomplished by scattering on two or three hundred pounds per acre of soil from an old alfalfa field, and harrowing in immediately. This harrowing in should be done so as not to expose these bacteria to sunlight for any length of time. The soil for inoculation may also be dried away from the sun, sifted and drilled in with an ordinary fertilizer grain drill.

5. Liming is beneficial to alfalfa on many South Missouri soils, and it is sometimes necessary to success. To begin with, however, one should learn to grow alfalfa on good land that does not need lime if he has such land on the place. Where lime is used, it should be applied at the rate of three or four thousand pounds per acre in a convenient form, except that from gas works, which contains injurious compounds. The ground limestone is the cheapest where large amounts are to be applied. Few of the very fertile lands in Missouri need lime.

6. On lands of medium to low fertility, manuring is usually essential to success, applying from ten to fifteen tons of manure before plowing. Fall top-dressing with manure, if applied with a manure spreader, four to six loads per acre, is very good practice on such lands. Care should be taken to use clean manure, free of grass and weed seeds.

7. Foxtail, crabgrass, and bluegrass are the worst enemies to alfalfa on most lands. On lands of medium to poor fertility the cultivation of the alfalfa with a disk harrow or a dull spring-tooth harrow followed by a drag harrow is very beneficial in controlling these grasses. After the first year there is practically no danger of injuring the alfalfa, even by very thorough working of the land. These cultivations should be given after the second and third cuttings, if possible.

8. On lands of average to poor fertility the application of two or three hundred pounds per acre of bonemeal is very helpful in securing a stand and increasing yields. This is best applied with the fertilizer drill, drilled deeply before the seed is sown.

9. On lands of medium to poor fertility a man must be willing to give a great deal of time and care to the preparation of the land, to fertilization, to seeding and to cultivation if he is to achieve marked success. On such lands alfalfa is a difficult crop to handle and is adapted only to men who will give it the proper attention.

10. The use of clean, strong germinating seed, free of dodder, is essential to the greatest success.

PROTECTION OF FRUIT TREES FROM RODENTS.

(By F. H. Ballou, Ohio Agricultural Experiment Station. Reprinted from Bulletin No. 208)

PREFACE.

According to the official report of the Ohio Department of Agriculture for 1907, there are, in the state, 266,340 acres of tree fruits, including all classes. Of those classes more subject to tree injury by rodents, viz., apple, pear and plum, there are 247,700 acres. Of apples alone there are 243,716 acres. This great acreage includes not only the extensive commercial plantations, but the thousands of small, home orchards, scattered in every part of the state.

There are no data available which would render possible anywhere near a correct estimate of the loss of and injury to trees, young and old, through the work of rodents (mice, rabbits and woodchucks) in Ohio. While the loss is confined principally to newly set orchards, replants in older orchards and the younger plantations generally, this loss, in the aggregate, is considerable. It certainly would not be far beyond the bounds of conservatism to figure the loss and injury at one dollar per acre per year, including all ages and conditions of the apple, pear and plum orchards of the state. The rate of loss would be less than this in the larger commercial plantations, even where the grass-mulch method of culture is practiced; for the commercial planter generally takes into consideration the various sources of danger and makes provision to meet these with effective means of protection. With the average home orchard the danger is greater than in the large plantation, and the possible means of protection more generally disregarded or overlooked.

Thus do we find, by a very simple caluculation, that there is probably incurred, annually, the astounding loss of over $200,000 in Ohio, from the work of the sharp teeth of bark-eating rodents, and those of mischievous and destructive habits.

Much complaint has been received by the Horticultural Department of the Experiment Station, of the injury and loss wrought by rodents, and repeated requests for suggestions as to effective means of protection of young and newly set orchards have been received. In many cases bearing trees are reported killed by mice.

In order to fully meet the demands of the planting public, this illustrated pamphlet has been prepared, which is the first of a series of purely practical bulletins planned to be issued in the future by the Horticultural Department of the Station. This series of bulletins will present in popular form that class of information so eagerly and persistently sought by the hundreds of beginners in horticulture who write to the Station for suggestions and assistance.

I. A TRUE ORCHARD INCIDENT.

Accompanied by a little daughter, who is deeply interested in and delights in trees, plants and flowers and the furred and feathered families which make their homes among them, the writer visited a certain section of our young apple orchard growing under the grass-mulch method of culture on a steep hill slope at "Dale View." It was in the late summer of 1908, the season at which the owners of young trees should plan for protection from rabbits, which often begin testing the sharpness of their teeth as early as November, while there is yet an abundance of green vegetation upon which to feed.

Fig. 1. "Baby rabbits—Come and see!"

The first tree visited was one which had been top-grafted in the spring of 1908, with a rare, new variety. While admiring the growth of this young tree, the loss of which would be a very serious matter indeed, the observing eyes of the little girl detected a bit of rabbit fur clinging to the grass stems near by. Here was a recognized clue to something of interest to a youthful lover of nature. A short search followed and its object was discovered.

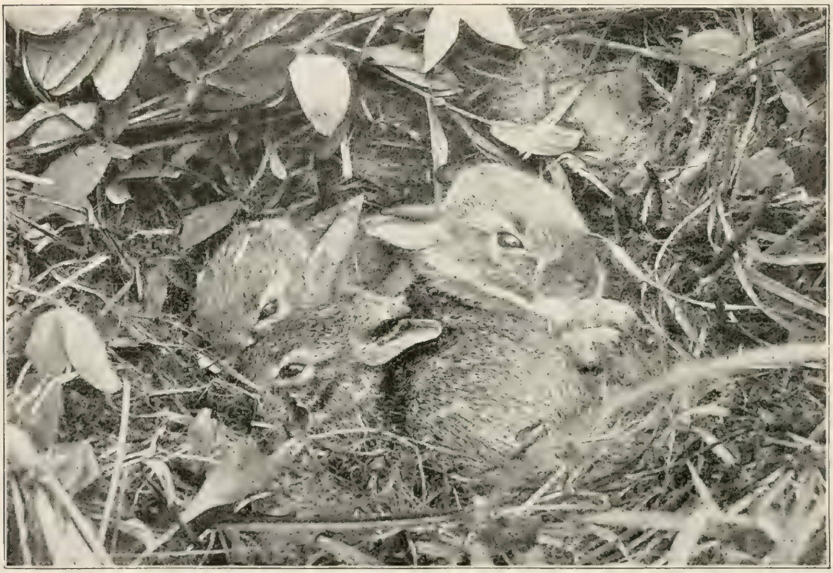


Fig. 2. Should we slay the enemy or protect the tree?

''Baby rabbits—come and see!'' Parting the blue grass and white clover she exposed four little, frightened balls of fur, shrinking down in the small, grass-lined excavation in the ground.

Here, indeed, was an orchard problem! Within five feet of the base of the almost priceless tree and surrounded by other young trees of value, was a quartette of youthful representatives of a formidable orchard pest. ''To kill or not to kill'' might naturally become the question in the mind of the orchardist under these circumstances. Should the enemy be diminished by four at a single stroke, or *should the tree be protected and the enemy spared?* The question in this instance was submitted to American girlhood for decision.

The verdict was rendered without debate. *The tree was protected —so was the enemy!* The one to continue growth unblemished with promise of fruitful days to come; the others to rapidly outgrow their period of innocence and harmlessness and develop into agile, rollicking, mischief-working rodents which inspire no further real appreciation until "bagged" by a careful gunner; then, at last, they "promise to be good"—served on the table of the orchardist.

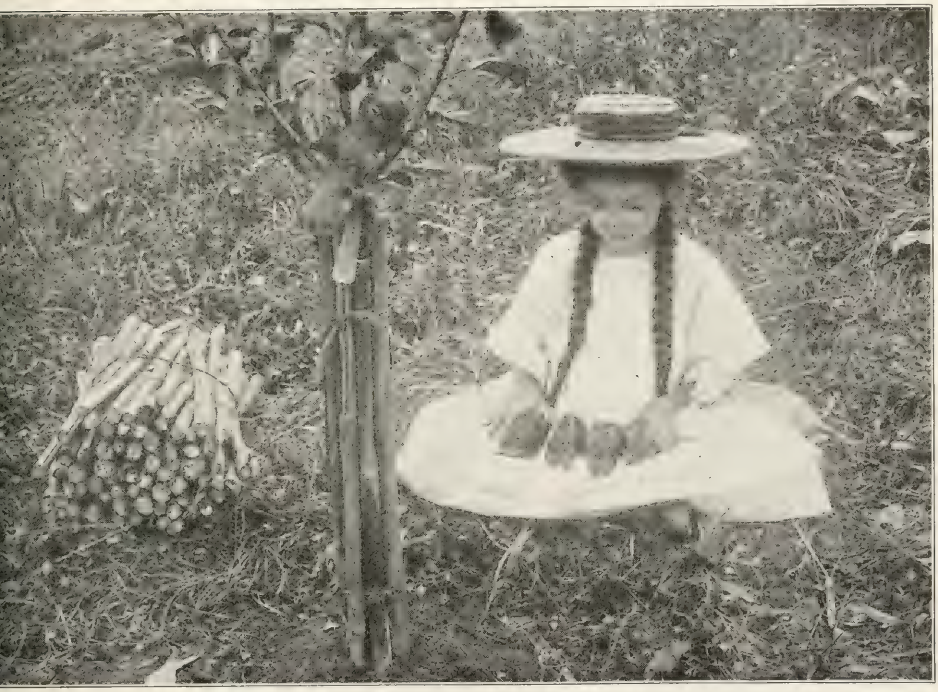


Fig. 3. The tree was protected—so was the enemy!

II. OTHER DISCOVERIES.

Let us resume our visit of inspection in this young orchard. Here is a row of trees six or seven years of age which has, in a measure, outgrow the period of danger of injury by rabbits. Dare we allow ourselves to feel secure in considering these beyond the need of further attention. By no means! They had been heavily mulched with grass cut from between the rows in June; but up through this mulch are pushing, here and there, sturdy growths of rag-weed, yarrow, sorrel and other strong-growing weeds which, together with the decaying material of the mulch beneath, provide excellent hiding places and covers under which the field or meadow mice will work when winter comes, if not before.

Let us draw back the mulch from about the stems of a few of the trees and see what may be found. Many "runs" and burrows of field mice are thus exposed, but the trees, so far, seem to be untouched; for it should be remembered that proper precautions had been taken each autumn previous, to protect these same trees from winter injury by mice. We are just about to congratulate ourselves that our young orchard is unblemished when we examine a much-prized tree of the Benoni apple and find it almost completely girdled. There are even *fresh* marks of mischievous, little teeth, impressing us with the truth that we should not consider our mulched trees safe from these little rodents even in the summer season.

Fig. 4. They promise to be good.

Resuming our way through a younger portion of the orchard we come upon a little tree whose stem is scarred by deep, jagged wounds where the powerful jaws and vicious cutting teeth of some rodent have been exercised. The bark has not been eaten as by rabbits or mice—

only terribly mutilated. The destructive work is at once recognized as that of a trespassing woodchuck or "ground hog," whose freshly-made burrow is found nearby.

Farther up on the hillside other mounds of fresh earth clearly show that a colony of these troublesome rodents is establishing itself and forcing upon us many destructive and unwelcome guests. With the patience and cunning that in time become characteristic of the devoted photographer, we succeed in catching, with the camera, a very-much-alive "chuck" indulging in a day dream in the entrance to his burrow.

Fig. 5. Where danger lurks.

Later this same burrow shall have dropped into its deep passage a small ball of rags or twine saturated with bisulphide of carbon, after which the entrance must be closed securely with a banking of soil firmly tamped or pounded. The deadly penetrating vapor or gas from this dangerous, explosive chemical, will fill the burrow and the inmates will lapse into a sleep during which there will be no dreams of mischief for the future.

III. OBJECT LESSONS IN TREE PROTECTION.

As an object lesson in tree protection, a row of young trees in this young orchard was fitted with the various types of mechanical protectors, now known and used by various horticulturists. These are shown by photographs on the following pages, and are accompanied by brief descriptions and remarks, which will readily enable the planter to decide which form or means of protection will best suit his conditions.

BANKING WITH SOIL OR CINDERS.

The soil or cinder mound as a protection against tree injury by field mice is first described, not only because it is quite effective in itself, but because it is recommended in conjunction with various other mechanical protectors designed to prevent injury by the larger rodents.

Mice rarely injure trees except where grass, strawy manure, boards or trash of some kind about the base of the tree provide a hiding place; they will not come out into the open to work, but choose to perform their depredations under cover.

In mounding fruit trees for protection from mice there are three important points to observe:

First, clear away the grass, trash or mulch from the base of the tree for a foot or more in all directions.

Second, with the foot or, better with a ''post tamper,'' thoroughly firm the surface of the soil about the base of the tree. This breaks down and fills any runs or burrows that may be just below the surface.

Third, with a few shovelfuls of fresh soil or cinders, form a small mound (twelve or fourteen inches in diameter at the base and from 4 to 6 inches high) about the stem of the tree, firming the soil well.

The tops of these small mounds are usually kept quite bare by the sweeping force of the winter winds, even if there be several inches of snow on the ground. Mice will not venture out on these exposures to feed on the bark of the trees; and burrowing into the freshly packed soil is not likely to be attempted in the winter, even in open weather.

The mounds may be left throughout the year, but they should be tamped hard and repaired by the addition of fresh soil each autumn.

Where cinders are available these are a most excellent and inexpensive material with which to mound the stems of all kinds of fruit trees. Mice will not burrow through the cinders as they do through soil.

THE WIRE SCREEN.

This is the ideal and complete, all-round protector, and it is, therefore, given first place among the mechanical forms. True, it is more expensive than many others, but it is lasting and thoroughly effective against all kinds of rodents which prey upon the stems of young trees. Being so light and open, it presents the least obstruction to strong winds; the air and sunshine are freely admitted; no dark and secure places of concealment, such as invite woolly-aphis and other forms of insect life are afforded.

This protector is made of galvanized wire cloth of one-quarter inch mesh (four 22 gauge wires to the inch) which may be purchased from the larger supply houses in rolls of one hundred lineal feet and in any width from twenty-four to thirty-six inches.

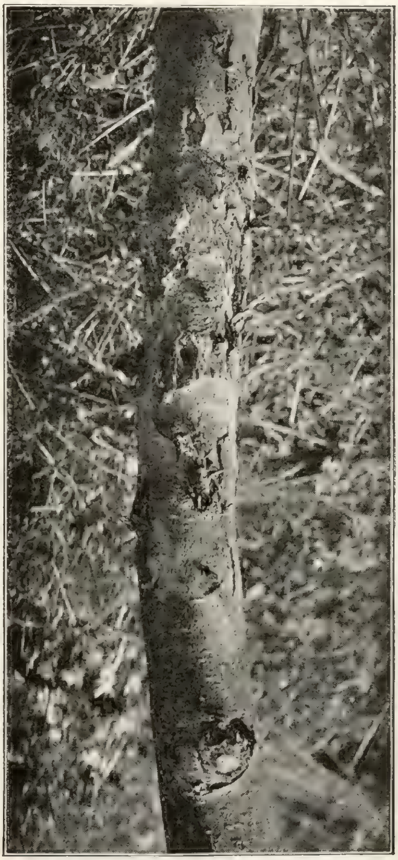


Fig. 6. Vicious work of woodchucks.

For apple trees the 24-inch width is usually the more convenient size. This is cut crosswise with tinners' snips or shears into 12-inch sections, making pieces 12x24 inches in size. These sections are carefully bent or rolled over a small round piece of wood (a section of broom or fork handle will answer), shaping them into cylinders 2½ to 3 inches in diameter. It is well to allow the edges to lap about one inch.

The cylinders are placed about the stem of the trees where their own tension will close them securely.

At the present quoted price of $3.00 per roll of 100 lineal feet for 24-inch wire cloth, protectors of the dimensions given will cost $3.00 per hundred, aside from the work of cutting and shaping them, which anyone handy with tools can readily do.

SMALL POULTRY NETTING.

This protector is made of ordinary weight, galvanized wire poultry netting of one inch mesh. This is quite as effective against rabbits as the closer woven wire cloth, but will not protect the trees from mice.

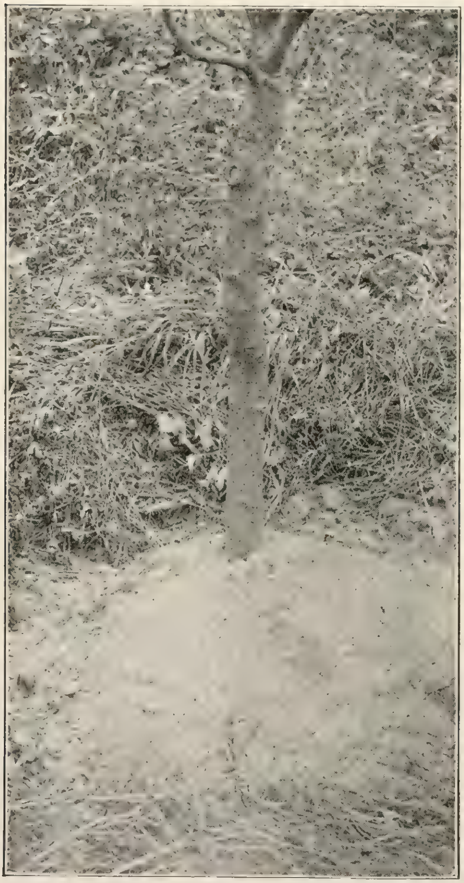


Fig. 7. The soil mound.

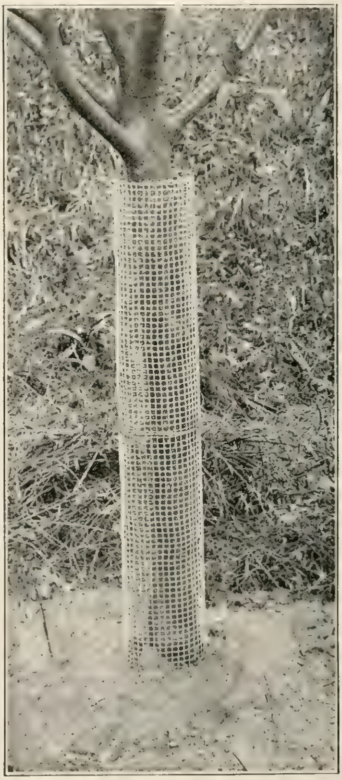


Fig. 8. The wire screen.

This netting may be purchased in bales of 150 lineal feet and cut and shaped just as described for the wire cloth. The present price of the 24-inch wire is $3.30 per bale. This style of protector would, therefore, cost $2.20 per hundred. These are very neat and sightly and do admirably for cultivated orchards, or wherever the method of culture or the environment does not favor the presence of field mice. In combination with a slight mound of soil about the base of the tree, mice will rarely prove troublesome.

STANDARD POULTRY NETTING.

It often happens that the planter of a few trees has at hand a quantity of old poultry netting of standard or 2-inch mesh. From this stock in hand quite serviceable protectors can be made by cutting out sections 18x24 inches in size and rolling them around a section of broom handle, as described. The mesh being so large, the pieces are cut six inches wider than in Figs. 8 and 9, in order that there may be at least two rounds of the netting encircling the stem of the tree. Rabbits and woodchucks will not be able seriouly to injure a tree thus protected. This form presents no obstacle to the work of mice; but mounding slightly, in connection, will baffle these little pests. Made from new stock 24 inches wide, purchased by the bale of 150 lineal feet, this style would, at present prices, cost $1.50 per hundred protectors.

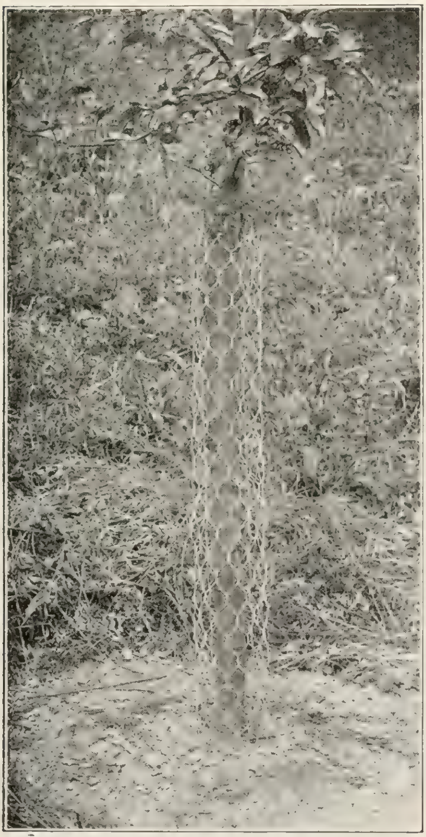


Fig. 9. Small meshed poultry netting.

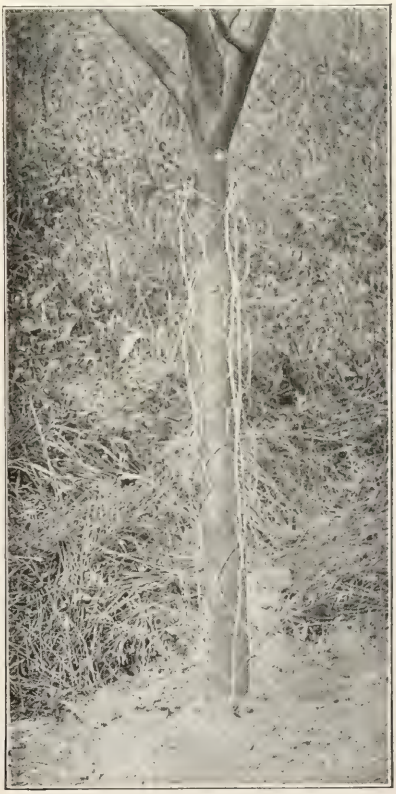


Fig. 10. Standard poultry netting.

THE SPIRAL WIRE.

Spiral protectors of heavy wire have been offered on the market for some years, but there are few used in Ohio. While effective against rabbits, they are of no avail against mice, except as the trees are mounded. Hence, this form is not superior in any way to the wire netting protectors already described.

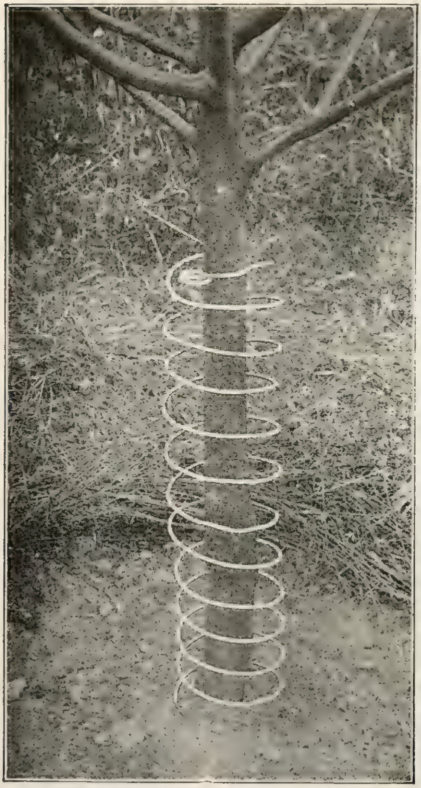


Fig. 11. The spiral coil.

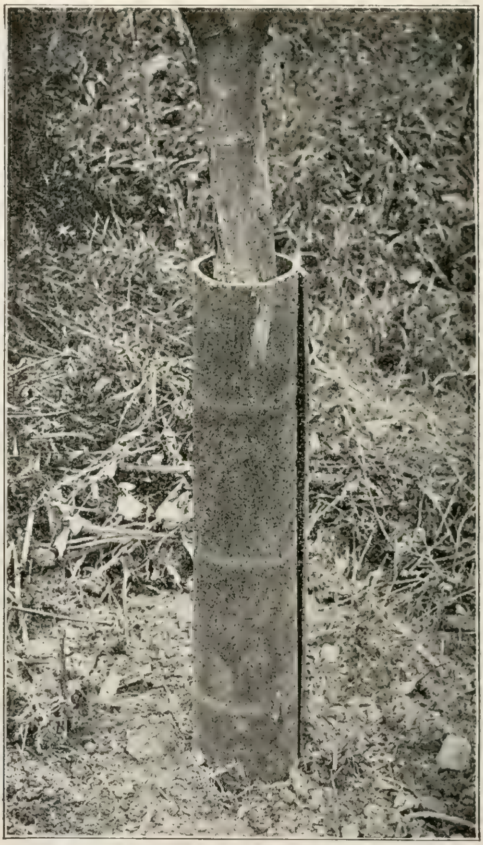


Fig. 12. Wood veneer.

WOOD VENEER.

This style is effective against all kinds of rodents; but, as they form a tight, close, light-excluding cylinder, various forms of insect life thrive in the crevices and under the cover thus provided. The woolly-aphis or root louse, when present in the orchard, increase in great numbers on the bodies of these trees under such covers. While the veneers are excellent protectors for the winter season, both from injury by rodents and from winter injury to the stems of the trees, they should be removed during the summer season. The different forms of wire cylinders are preferred.

CORN STALKS.

There is no device superior in effectiveness against rabbits and goundhogs than this, and certainly none cheaper for the farm orchard. There is practically no cost of material where corn is grown or cornstalks fed. A good plan is to take the bundles of stover as they come from the field, before feeding to the stock. Lay the bundle on a low platform or broad, low box, and "square-off" the butts with on ordinary "Lightning" hay knife. A solid block and a broad-ax may be made to answer, but the hay knife is much better. Next cut off a two-foot length of the lower ends of the stalks in the same way. These sec-

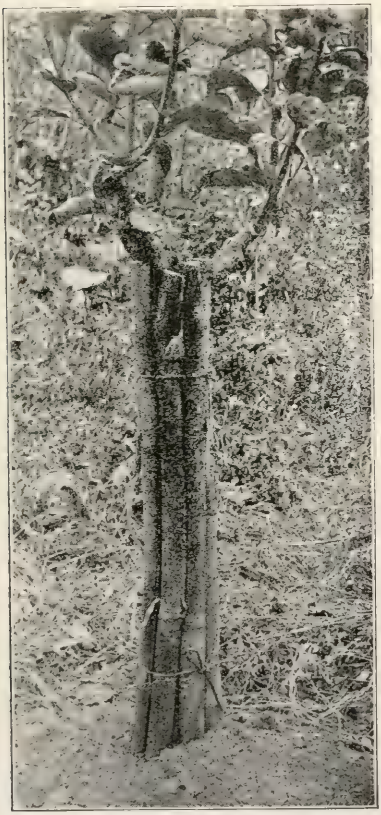


Fig. 13. Corn stalks.

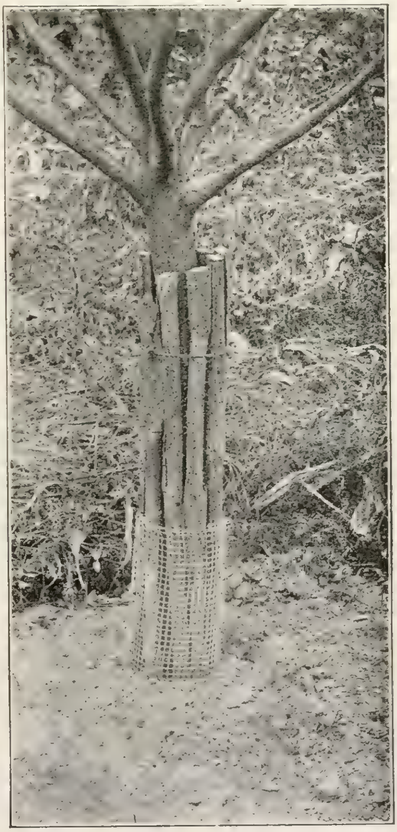


Fig. 14. Wire cloth and corn stalk.

tions may be fed to the stock either in a manger or in the feed lot, where the blades will be cleanly and neatly stripped off. After a few days' feeding, several hundreds or even thousands of these uniform length stalks may be rapidly gathered up and tied in bales for future use. Five or six stalks bound firmly about the stem of a young tree, with twine or short sections of bailing or broom wire, as shown in the picture Fig. 13, will constitute a protector that will last not only for one season, but for several, or as long, usually, as the tree needs protection from rabbits. The stalks readily yield as the stem of the tree increases in size. In case wire ties are used for binding on the stalks, great care should be exercised to see that these are removed from about the tree when the stalks are taken off. If not removed, they will drop down about the collar of the tree and become covered with soil and forgotten. Trees have been killed by wire girdling in this way.

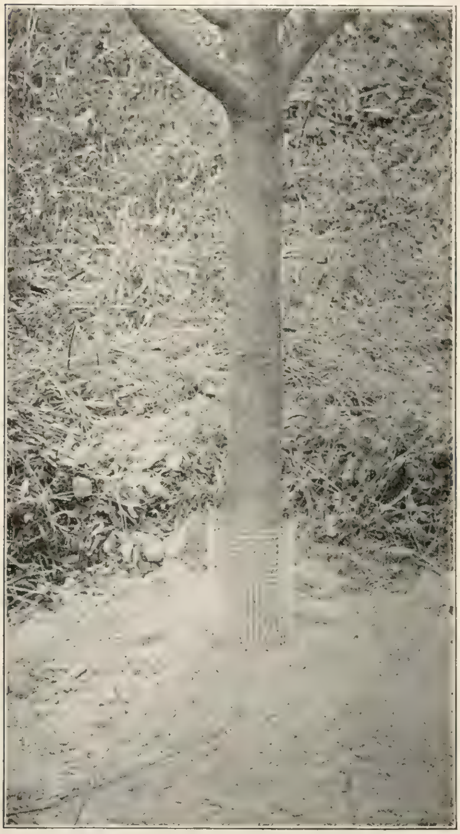


Fig. 15. The short, wire cylinder.

By mounding the bases of the trees slightly with fresh soil and firming it well, a stalk-protected tree is quite secure from all rodent enemies.

COMBINATION WIRE CLOTH AND CORN STALKS.

This form will appeal to the most exacting. The stalks protect the stems from rabbits, while the 8-inch wire cloth cylinders, cut from the same material in Fig. 8, completely baffle the mice even in badly infested orchards. The wire cylinders should be forced down two or three inches in the ground. These cylinders are formed from sections of wire cloth 8x12 inches in size. Cost, about 1 cent each.

THE SHORT, WIRE CYLINDER.

When trees have attained the age of six or seven years they are usually beyond the period of injury by rabbits. We then have to protect only against mice. The short galvanized wire cloth cylinder alone, well imbedded in the soil about the base of the tree, is quite sufficient even in badly infested orchards, except when unusually deep snows come and lie a considerable time on the ground. It may then be well to tread down the snow immediately about the tree, to prevent mice burrowing about and feeding upon the stems above the protectors.

THE SIMPLE PAPER CYLINDER.

In combination with the soil or cinder mound, paper wrappers of different kinds are temporarily effective in protecting from rabbits; but these protectors should be removed during the summer season because of the fact that they afford excellent places for concealment of the larvae of certain insects and for the woolly-aphis.

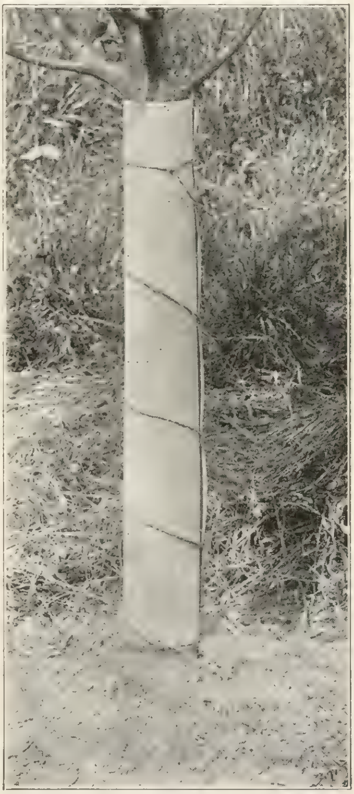


Fig. 16. The simple paper cylinder.

A simple paper cylinder formed of ordinary printing, wrapping or even newspaper, will serve well for a single winter. The picture above shows clearly the manner of applying and tying in place. All paper wrappers should extend a little below the surface of the soil at the base.

BUILDING PAPER.

A good grade of building or "sheathing" paper is, of course, preferable to wrapping or newspaper for tree protection. According to grade, these heavier wrappers should cost but from one-tenth to one-fifth of a cent each or 10 to 20 cents per 100, if the paper be purchased by the roll of 500 square feet. These may be put on the trees in the form of a plain cylinder, or the paper may be cut into strips from four to six inches wide and wrapped spirally about the stem to the desired height, beginning at the base and fastened with twine in the usual way.

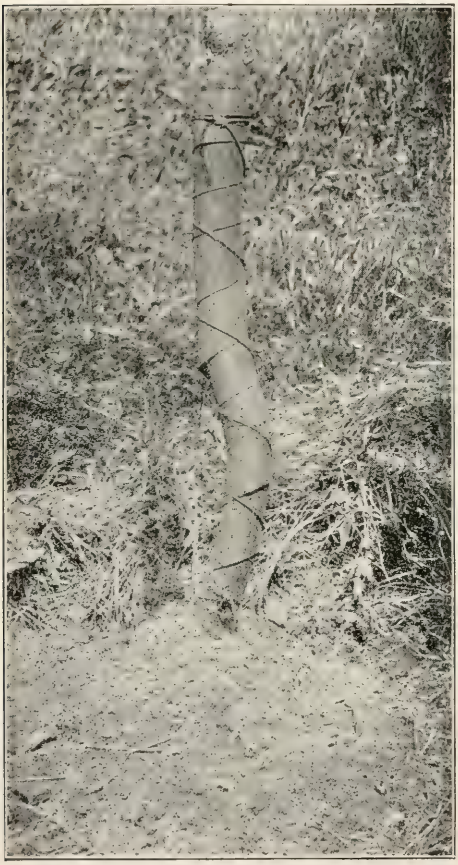


Fig. 17. Building paper.

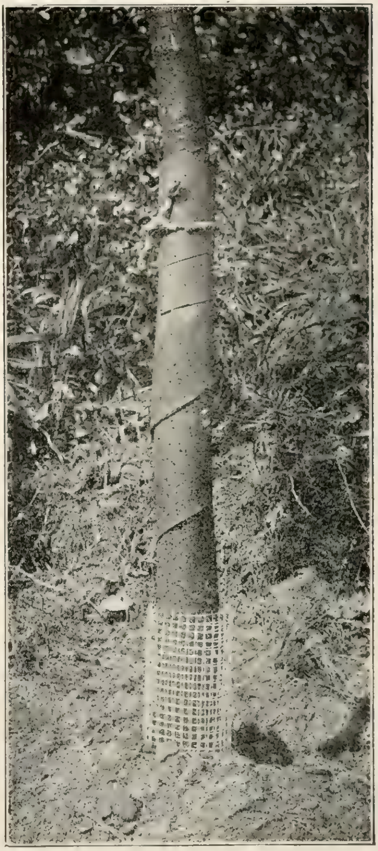


Fig. 18. Combination wire cloth and building paper.

There are two points of superiority in the plan of spiral wrapping, over the cylindrical protector; first, a crooked bodied tree can be closely and neatly covered (see picture above); second, the spiral wrapper is more resistant to the strong winds of winter which sometimes play havoc even with building paper protectors if not securely fastened with twine spirally applied.

COMBINATION WIRE CLOTH AND BUILDING PAPER.

This protector, put on as shown in the picture, is trustworthy under almost all conditions. The wire screen discourages the mice while the paper wrapper is accepted by the rabbits as an invitation to look elsewhere for forage. The paper may be removed and the screen retained during the growing season.

ANIMAL BLOOD.

Fresh blood from a slaughter house, applied as a paint to the stems of trees in autumn and again in mid-winter, will prevent the work of rabbits. Or, the bodies of the trees may be well rubbed with a piece of fresh pork or beef liver with the same results. These remedies are not effective against mice, however, and should be used in connection with banking or screening the bases of the trees.

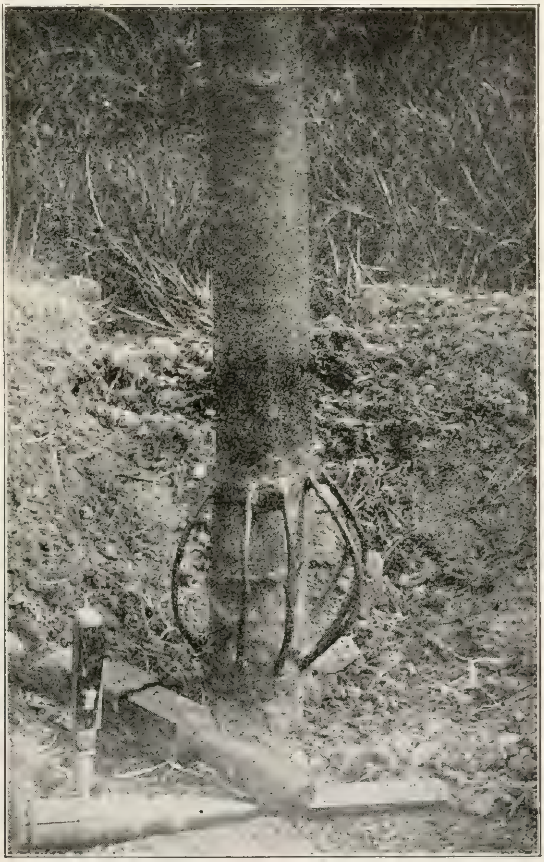


Fig. 19. A Bridge-grafted tree.

Various repulsive and unnamable mixtures have from time to time been recommended as against the work of rabbits, but the above is just as serviceable, and much more cleanly to apply.

AN EFFECTIVE WASH.

A thick paint of lime, soap, carbolic acid and sulphur is recommended to protect fruit trees from injury by rabbits, sheep and mice. It is made as follows: Slake one peck of fresh, stone lime with old soap suds, thinning to the consistency of whitewash. For the one peck of lime add one-half gallon of crude carbolic acid, four pounds of sulphur and one gallon of soft soap. Paint the trunks of the trees with this in late autumn.

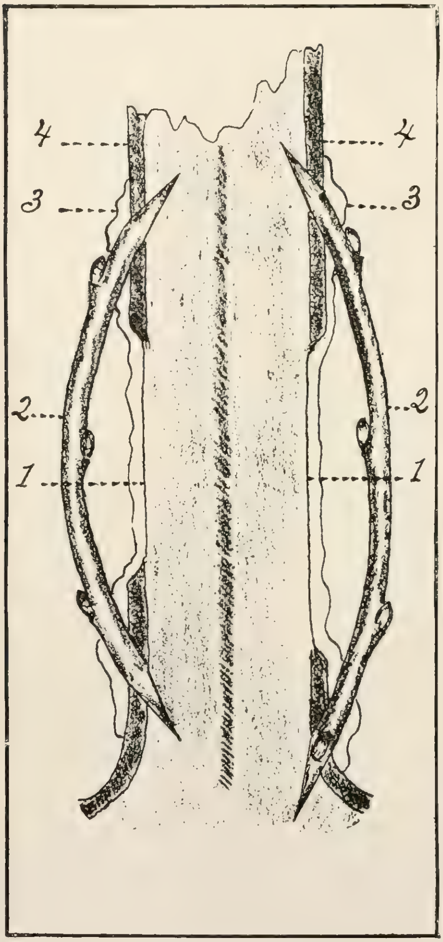


Fig. 20. Bridge-grafting in detail.
1. Wound. 2. Scion.
3. Wax. 4. Bark.

THE MODERN LIME-SULPHUR MIXTURE.

It has been found that the lime-sulphur mixture, such as is used for spraying for scale insects is quite effective in preventing work by rabbits in the orchard and nursery. This is the ordinary 15-15-50 boiled mixture with which nearly all home owners are now familiar. It is used as an autumn spray, the stems of the trees being thoroughly covered with the mixture entirely to the ground.

For those who desire to prepare a small quantity of the lime-sulphur mixture for a few trees, to be used as a paint, the following will be helpful:

Slake one pound of fresh stone lime in a small quantity of hot water. Or, one pound of ordinary hydrated or prepared lime may be used instead.

Boil for one hour the one pound of lime with one pound of sulphur in one gallon of water. Thin the boiled mixture with enough hot water to make three and one-third gallons. This should be used while fresh, keeping it well stirred.

CONCLUSION.

If young trees be girdled in late pring just as growth is beginning, they may be successfully treated by binding about the wounded parts a heavy covering of smooth tenacious soft clay. A new bark will sometimes form beneath the clay if the inner bark or cambium be not entirely destroyed. It is safer however, to insert a few long scions, as shown in the accompanying picture.

This is called "bridge-grafting." The sap circulation of the tree, cut off by the wound made by the rodents, is resumed through the scions, which become a part of the tree—enlarging and growing together until, in after years, only a slight enlargement or "bulge" on the trunk of the tree thus treated will be noticeable.

In bridge-grafting, the wounds should be made clean and smooth with a sharp knife and covered entirely with grafting wax. The scions should be cut a trifle longer than the span to be bridged, so that, when they are inserted, their curving form will tend to keep them firmly fixed in position. The two ends of the scions are cut to a thin, wedge form. Incisions are made in the bark with a narrow chisel—those above the wound sloping upward and those below sloping downward. Insert the scions firmly and wax heavily and securely all wounds made in the operation, especial care being exercised to press the wax in firmly and neatly about the points of union of scions with the body of the tree. The sectional drawing will show more clearly than printed description the manner of making the "bridge."

RECIPE FOR STANDARD GRAFTING WAX.

Melt together four parts (by weight) of resin, two parts of bees wax and one part of tallow. Pour the mixture into a pail or tub of cold water. As the mass begins to cool so that it can be handled, grease the hands with tallow and pull and work the lump of wax until it becomes quite light in color. Form into small balls or sticks for convenient use. This wax will keep in good condition indefinitely.

ALFALFA FOR HOGS.

(George W. Williams, Humansville, Mo.)

I have been growing alfalfa on my farm here in Polk county, Mo., for sixteen years, but was about six years learning how to grow it, and while learning the secret of success I also learned its feeding value, both as a green feed and hay. For the last ten years I have used it largely in pork production and I consider it a very important adjunct in hog raising, fed both in the green stage and as hay. I pasture it but very little, as I value it too highly to let stock run on it and muss over it and waste more or less, but I soil it—that is, cut it green and feed it to all kinds of stock that are confined to small space. But as we have the hog under consideration, we will confine our remarks to him.

Starting with spring, as soon as the alfalfa gets high enough, I cut and feed my hogs about all they will eat up nice and clean—none to waste—in addition about one-fourth as much corn as when on bluegrass, and they grow much faster when fed the alfalfa than in either of the other cases. The brood sows seem to give a much better flow of milk for the pigs, and the little pigs learn while very young to eat it. When winter sets in and the green alfalfa is no longer available, I feed the alfalfa hay with the same results as when fed green. In making pork I feed green alfalfa if it is in season. If not, I feed the hay with about one-half the corn that I would feed if I were fattening hogs on corn alone, and find that the hogs make as fast gains and a decidedly cheaper gain, and as the hog is in no hurry to be killed we can afford to wait a little while if we are getting pounds cheaper, as that is the one thing most desirable.

It is claimed by some that alfalfa alone will fatten hogs. This I doubt. I have fed it under nearly all kinds of conditions, and I have never been able to take a thin hog and put him in marketable condition on alfalfa alone, but it will make an improvement in his condition and a big improvement in his growth—if he was not full grown to start with.

During the scarce winter of 1901-'2, after the terrible drouth, I was caught with quite a bunch of hogs on hand and with no corn to feed them. I fed all the alfalfa hay I had to the hogs, sent to Kansas and bought and shipped baled alfalfa hay in to feed my hogs, and I fed nothing else to them, and they grew fine. I had several sows that farrowed during the winter and saved as many pigs as usual. The pigs grew as fast as if the sow had had a corn or mast ration.

I do not know what medicinal qualities the alfalfa possesses, but I do know that I have not had a sick hog in my pen for ten years, nor have I seen any sign of intestinal worms. I cannot say that the healthy condition of my hogs is due to alfalfa, yet I am very strongly inclined to give it the credit. It seems to be not only a balancer in the rations for growth and fat, but also for health.

Brother hog raisers, let me urge you to grow alfalfa for your hogs, if for no other purpose. You *can* grow it; then, why not?

PORK PRODUCTION WITH FORAGE CROPS.

(C. A. Willson, Instructor in Animal Husbandry, University of Missouri.)

The economy of production in hogs lies not in the use of cheap grain, but in the substitution of cheap forages for grain. The exclusive feeding of corn to hogs in the past, while profitable while corn was cheap, has resulted in hog feeding practices which are now unprofitable with our present high priced grains and foodstuffs. The expenditure of six pounds of corn to produce a pound gain in hogs may have been profitable when corn was worth 25 cents and 30 cents per bushel, but it is evidently now unprofitable when corn is worth 70 cents per bushel. We must, then, work out more economical systems for producing pork if we are to continue producing this commodity.

The rise in price of corn during the last three or four years has been most fortunate for hog raisers, if for no other reason than that it will result in more rational systems of hog raising. The hog in his normal habitat is a ranging and grass eating animal. It is as unnatural, as well as unprofitable, to maintain hogs wholly upon the more concentrated and heating foods as it would be to keep horses or cows in the same manner. Range in pasture affords growing animals the exercise so necessary to health and proper development; and the succulent grasses, rich in muscle and bone forming elements, tend to prevent disease and counteract the heating effects of corn. Grass is as essential for the development and maintenance of swine as for cattle, sheep or horses.

The adaptability of forages for hogs will depend on the rate of growth and succulence of the plant. The hog in his wild state lives along lowlands and in forests bountiful with fruits, nuts and succulent herbs and plants, and if we are to supply this part of his ration in domesticity we must supply forage which has an abundance of succulent juicy leaves. Neither is the hog adaptable for grazing short pasture. He does not obtain his forage naturally in small mouthfuls as does the sheep, cow or horse, but takes his forage from plants more rank and vigorous in growth. He feeds quickly in the morning and evening, and prefers the remainder of the day to lie in the shade.

AMOUNT OF GRAIN ON FORAGE.

While good forage will reduce the amount of grain necessary to produce a pound gain from one-third to one-half, yet it should not be used alone except when only a maintenance ration is desired. Mature hogs, thin in flesh, may be expected to gain on good forage without grain about one-half pound per head daily. However, good forage under average conditions is about equal to a maintenance ration. The greatest economy through the use of forage is obtained where the hogs are fed from one-half to two-thirds of a full ration. A full ration for a hog under ordinary conditions is about three to three and a half pounds of grain per hundred pounds live weight per day. One-half to two-thirds of a full ration would, then, be from two to two and one-half pounds of grain per hundred pounds live weight per day. If a full feed is given the hog while on pasture he will have no desire for other food and will therefore make no use of the forage which is before him. On the other hand, if he is given too little grain he may have to hustle too much and will not make gains rapidly enough for profitable growth. The following tables will illustrate the economy in supplying less than a full feed while on forage:

EFFECT OF FULL FEEDING HOGS ON FORAGE.

TABLE I.

Ration.	Daily gain.	Grain per lb. gain.	Cost of 100 lbs. gain.	Price received per bu. corn eaten.	Daily profit per pig.	Total profit per pig.
Nebraska (14 weeks on alfalfa.)						
Lot I—½ lb. per cwt. daily..............	.28 lbs.	1.21	$.78	$2.84	1.3c	1.28
Lot II—1½ lbs. per cwt. daily.............	.37 lbs.	2.22	1.39	1.38	1.5c	1.48
Lot III—2½ lbs. per cwt. daily............	.51 lbs.	3.32	2.08	.92	1.7c	1.64

Lot 1 did not do well enough to warrant repetition of the test. While a very good price was obtained per bushel of corn fed, yet the pigs had an unthrifty appearance—they had the appearance of being stunted.

Lot 2 were thrifty, but not fat.

TABLE II.

Ration.	Daily gain.	Grain per lb. gain.	Cost of 100 lbs. gain.	Price received per bu. corn eaten.	Daily profit per pig.	Total profit per pig.
Nebraska (17 weeks on Alfalfa.)						
Lot 1—1 lb. corn per 100 lbs. live weight daily..........................	.50 lbs.	1.32	$.83	$2.33	2.3c	$2.68
Lot II—2 lbs. corn per 100 lbs. live weight daily..........................	.65 lbs.	2.20	1.38	1.40	2.6c	3.10
Lot III—3½ lbs. corn per 100 lbs. live weight daily..........................	1.08 lbs.	3.30	2.10	.91	3.6c	4.27

TABLE III.

Rations.	Daily gain.	Grain per lb. gain.	Cost of 100 lbs. gain.	Price received per bu. corn eaten.	Daily profit per pig.	Total profit per pig.
Utah (pasture.)						
Lot I—pasture alone	.15 lbs.	......	......	....	......	......
Lot II—Grain, ¼ full ration	.49 lbs.	2.47	......	....	......	......
Lot III—Grain, ½ full ration	.70 lbs.	3.04	......	....	......	......
Lot IV—Grain, ¾ full ration	1.04 lbs.	3.83	......	....	......	......
Lot V—Grain, full ration	1.13 lbs.	4.89	......	....	......	......

TABLE IV.

Montana (Alfalfa.)						
Lot I—Grain, ½ full ration	1.03 lbs.	2.82	$2.82	....	......	......
Lot II—Grain, full ration	1.37 lbs.	4.24	4.24	....	......	......

In each experiment when less than one-half of a full ration was fed the greatest profit per bushel of corn was obtained, but not the greatest profit per head. In all experiments on forage carried on at the Missouri Experiment Station the greatest returns per acre were obtained where a grain ration to the extent of 2½ to 3 per cent. of the live weight of the hogs was given.

NUMBER OF HOGS PER ACRE.

The number of hogs that may be pastured per acre will be governed by the luxuriance of the pasture, the amount of grain that is fed, the size and age of the hogs. Generally it may be said that an acre of red clover should support six to ten hogs for three to four months. Alfalfa, the king of hay and forage plants, should pasture from twelve to twenty-five hogs per acre. Alfalfa should not, however, be so pastured that mowing will not be necessary. The general practice should be to pasture with fewer hogs than will be able to keep back a rank or woody growth. Only enough hogs should be put on as will allow one or two cuttings to be made during the pasturage season. The cutting of the alfalfa will freshen the pasture and make it more desirable for the hogs pasturing it, and the hay may be used for growing cattle and colts during the ensuing winter. Bluegrass will support eight to twelve head per acre for five months. Green rye will support ten to twelve head for eight weeks, and the ripe grain from ten to twelve head for five to eight weeks. Cowpeas, soybeans, chufus, artichokes and peanuts will provide feed for eight to twelve head for five to eight weeks, depending upon the proportion of grain provided. Rape is a very vigorous grower and will furnish succulent forage for nine to twelve head per acre for eight to ten weeks. Best results with rape are obtained where oats and clover are sown with it. Corn that is to be hogged off when mature will feed, when there is an estimated yield of fifty bushels per acre, ten hogs for five weeks or thirty hogs for about two weeks. These estimates should be taken as approximations which may vary greatly under conditions governing any situation.

The low price of grains in past years has resulted in a great many experiments being worked out with numerous combinations of grains; but conditions are greatly different at the present time. Profitable gains can no longer be made through exclusive grain feeding, but must come through the judicious use of forage crops. With the necessity and demands of the swine growers of the State in mind, the Missouri Experiment Station of the University of Missouri has planned a series of forage crop rotations which should throw considerable light on the value of forage crops for hogs and the value of forage crop rotations for the land. The experiments are so planned that all results will relate to the area basis. Since there is no way of measuring the number of pounds of forage that is eaten by a hog on forage, and since all farming operations must finally relate to the area basis, the work is so related as to give the possible results per acre with each forage used. The plan is to secure the average of several years, since the results of any one year cannot be taken as absolute. An average of a series of years should give us the relative values of different forages and the average possible results to be obtained from any forage under Missouri conditions.

BLUEGRASS.

There is no forage so extensively and universally used for hogs as is bluegrass, and yet so little is known as to its true value for swine feeding. Bluegrass or orchard grass will supply green feed as soon as the snow is off, and is among the best for early spring pasture. It should not be pastured too closely by hogs, and it then will furnish abundant nutritious feed until the first of August. Under average conditions, bluegrass will support from ten to fourteen shoats, weighing seventy pounds, from May 1st throughout the summer, when supplemented with a corn ration per day to the extent of 2¾ to 3 per cent. of the live weight of the hogs; and with this number of hogs there may be produced about 882 pounds gain per acre. The best results with bluegrass are obtained up to August 1st, after which it becomes too dry for swine feeding purposes. The results at the Missouri Experiment Station show that during the past two years' trial there were no net returns when the results were taken for the whole season, but from the beginning of the season up until the second or third week in August quite satisfactory results were obtained. In fact, during the second year the forage returned a net profit up to the third week of August of $18.80 per acre. For the first fourteen weeks on bluegrass during the season of 1909 there was required to produce a pound gain 3.64 pounds of corn; or, in other words, one bushel of corn on bluegrass up to August 17 produced 15.4 pounds of pork. At 6 cents per pound one bushel of corn then was worth ninety-two cents per bushel. A more correct value for the corn would be obtained by deducting the rental value and the taxes ($4.00), which would give us the value of eighty-six cents for the corn fed. For the remaining portion of the season the results were not so satisfactory.

Throughout this feeding trial the hogs were made to produce three-quarters pound gain per hundred weight per day and were fed corn in sufficient quantities to produce this gain. At the conclusion of the experiment the results showed that the hogs were being fed to the extent of 2.9 per cent. of the live weight of the hogs, which is equal to about three-quarters of a full ration when they were making the most profitable gains.

ALFALFA.

Alfalfa is the king of forage plants and will give better results for hog feeding purposes than any other forage known. It is a nitrogenous forage and therefore furnishes the necessary protein and mineral matter for the highest development of muscle and bone. When fed in conjunction with corn to the extent of three-quarters of a full ration the best possible results were obtained. When corn was relatively low the Nebraska Experiment Station found that the liberal use of corn on alfalfa pasture was most economical; however, during the present high price of corn the most economical results would be obtained through the use of corn to the extent of three-quarters of a full ration. The results obtained at Nebraska were as follows:

TABLE VI.

	Lot 1. No grain, lbs.	Lot 2. Light grain ration.	Lot 3. Medium grain ration.	Lot 4. Heavy grain ration.
Average weight of pigs, August 27	74.0	73.5	73.5	72.5
Average weight of pigs, October 27	75.4	95.2	113.3	126.2
Average gain from August 27 to October 27	1.4	21.7	39.8	53.7
Daily gain per pig	.02	.34	.63	.85
Average amount of corn consumed by each pig per day	....	1.33	2.48	3.46
Corn consumed per pound gain	....	3.86	3.98	4.23

From the foregoing table it will be noticed that when alfalfa was fed alone it was about equal to a maintenance ration. The best results from the corn were obtained with a light or medium grain ration. Under ordinary conditions alfalfa will forage from twelve to twenty shoats. It begins growing early in the spring and is very excellent for early forage for hogs. Alfalfa and corn will produce a greater net profit to the farmer than any other combination of crops known to hog husbandry.

CLOVER.

Red clover ranks next to alfalfa as a forage plant for hogs. It, however, will not feed so many head per acre and has also a shorter forage season. During the season of 1908 the Missouri Experiment Station of the University of Missouri obtained a net result per acre, with pork at six cents, of $37.59 with clover. In this experiment 2.64 pounds of corn produced a pound gain. With the rental value of the land at $3.00 per acre and pork worth five cents, the corn fed was worth $1.00 per bushel. Clover should not be pastured so closely that there will not be some woody growth.

RAPE FORAGE.

As one of the annual forage crops, rape is valuable on account of the cheapness of the pasture and quantity of feed furnished and the usual thriftiness of the hogs on the pasture, and also because it adds variety to the ration and is valuable at a time when rations may be short. A good growth of rape will supply pasture for twelve to twenty hogs to the acre. With a very rank growth it may supply feed for eighteen to twenty-five head per acre. Under ordinary conditions where the feeding period is to extend from ten to fourteen weeks, it is advisable to pasture at the rate of ten to twelve head per acre.

Rape is usually sown in the early spring as soon as danger of frost is over and will furnish pasture beginning with the middle of May until the third week in August. The best results are obtained when oats and clover are sown with it. Sow from four to six pounds of rape ahead of the drill and then drill in one bushel of oats per acre and six to ten pounds of clover seed. If rape is not grazed too closely in the spring so that the stalk is not eaten off, it may grow up and make fall pasture. It should never be pastured so closely that there are not at all times some leaves on the stalk. The leaves are the lungs of the plant, and when deprived of these it is deprived of one of the organs used in growth. It should not be turned onto until the plant has become well developed and is from fourteen to eighteen inches in height. It will then have developed a large root system and large stalk, which will enable it to withstand more severe pasturing.

It is often difficult to get hogs to eat rape at first if they have not been accustomed to it. For this reason it is not looked upon with favor by some breeders. Its value as a forage crop, however, has been proven by experiments carried on by the Missouri Experiment Station and the Wisconsin and the Michigan Experiment Stations. It has been shown to have a feeding value, when combined with corn and shorts, equivalent to 2,436 pounds of grain and a money value of $19.49 per acre. When the cost of seeding is considered, rape proves valuable for pasture, as the seed can usually be bought for eight cents per pound and four to six pounds per acre is all that is needed. Rape is a rank grower and heavy feeder and should only be sown in rich soils. It does not give the best results on thin, worn-out soils.

Considerable complaint is often made because of the sores and scabs which often form on the hogs. Sometimes the skin has the appearance of being blistered. Especially is this true of white hogs. The remedy is to move the hogs to another pasture for a part of the time and dip the hogs or apply sulphur and lard to the sores.

During the past two years the Missouri Experiment Station has found that, generally speaking, for hogs on rape, oats and clover, there is required about 2.6 pounds of corn to produce a pound gain, when fed to the extent of producing three-quarters pound gain per hundredweight per day. For the first ten weeks of the forage season on rape, oats and clover in 1909 the average amount of corn required to produce a pound gain was 2.58 pounds, or, in other words, every bushel of corn that was fed on this lot up to August 10th produced 21.7 pounds of pork, which at six cents per pound would make the corn worth $1.30 per bushel. This, however, does not take into account the rental value of the land. Deducting the rental value and taxes of the land ($4.00), the value of corn per bushel would be $1.12.

RYE GRAIN.

The most profitable systems of agriculture are those systems so planned that the animals fed will harvest their own grain crops and forage crops. The amount of labor required under such systems will be reduced, the manure evenly distributed on the land with the least losses, and the mechanical properties of the soil left in the best condition.

Rye may then occupy an important place in the crop rotation systems for hog farms. It is adaptible for fall, winter and spring feeding, and for hog feeding purposes when the grain is ripe.

The Missouri Station during the past season hogged off two plots of rye grain with quite satisfactory results. The grain was allowed to ripen to such an extent that the heads had crinkled down. In this condition the rye seems to have woven itself together, leaving the heads drooping to within about one foot from the ground, and the hogs were able to walk among the grain when in this condition and pick off their food at will. A gross profit of $20.00 to $30.00 per acre may be obtained from rye when fed off in this manner.

SORGHUM.

The principal value of sorghum lies in the fact that it furnishes a great abundance of pasture during dry, hot weather, when other varieties of crops make but little growth. If it is well started it will furnish fairly good food for 14 to 20 head per acre for 10 weeks (July 1 to September 14). The general conclusion of experiments carried on heretofore has been that the results have not been as satisfactory as with other forages. However, the Missouri Station found during the season of 1909, that on sorghum forage, 3.40 pounds of corn would produce a pound gain or in other words, a bushel of corn on sorghum forage produced 16.45 pounds of pork. With pork at 6 cents per pound, and the rental value of the land ($4.00) deducted, the corn fed to hogs on sorghum forage would be worth $1.04 per bushel. The sorghum should be turned onto when from 1½ to 2½ feet high.

COWPEAS AND SOYBEANS.

In every rotation there should be some leguminous crop. Cowpeas and soybeans are becoming recognized as foods of great feeding and fertilizing value. They do much toward restoring the fertility of the soil, and many farmers are making use of the vines as a forage crop for hogs. The plant will make a good growth on rather poor soil and furnish feed in late summer and early fall when other green crops may be short. They come at the time when they are valuable as a forage crop to be fed in conjunction with corn that is being hogged off. Cowpeas may be turned onto from two to three weeks previous to the time when corn is mature, and are valuable as a food for hogs in the beginning of the fattening period. Much added food value can also be obtained where cowpeas are sown in the corn at the last cultivation. Cowpeas may return a net profit of from $15.00 to $30.00 per acre when fed off with hogs.

CORN.

When farm labor is high-priced and difficult to secure the hog may relieve the situation by harvesting the corn for himself. The practice of turning swine onto a field to gather the corn which they eat is termed ''hogging off or down,'' and was formerly looked upon as a shiftless or lazy procedure. It has lately grown much in favor, and is found to be good farm economy when rightly managed. The hogs should not be given access to the entire field, but should be allowed the run of but a portion of the field at a time. By so doing, the hog may have fresh food, even though of the same character, every eight or ten days and will also, by this method, clean up his harvesting operations as he goes. A portion of the field is set aside from the rest by temporary fences of hurdles. A wire fence with posts temporarily located is sometimes used, but wire fencing is difficult to handle in heavy corn. If the field cannot be subdivided, a very good practice is to turn in both large and small hogs. The large hogs will break down the corn and the smaller ones will clean up what is left by the larger; however, the first-mentioned practice is the more desirable.

This system of harvesting corn is most advantageous when the weather is dry. It may not be most profitable to keep hogs on corn after heavy rains, as there is likely to be a waste of corn and also injury to the hogs and to the land. Corn, when harvested in this manner, may return a net profit of $20.00 to $35.00 per acre. Missouri Experiment Station during the past season received an average net return of $36.24 per acre, with pork at 6 cents per pound.

HOG FORAGE CROP ROTATIONS.

A seeming lack of adaptability of forage crops to lend themselves well to rotation systems has perhaps more than anything else, worked against the general use of especially provided forage crops for hogs. They do, however, when carefully planned, lend themselves well to systems of crop rotation.

The difficulties involved in planting forage crop rotations are, first, to meet requirements at all times of the forage season; second, to select the forage adaptable to the particular class of animals to which it is to be fed; third, to so arrange the system that the amount of labor will be distributed throughout the season; and, fourth, to conserve and to increase as rapidly as possible the fertility of the soil. These requirements may be well met under varying conditions by some of the following two, three or four year crop rotations.

To secure the best results with forage crops and to build up the soil fertility to the greatest possible extent, it is necessary in any crop rotation that there be introduced a leguminous or nitrogen gathering crop. One of the most perfect nitrogen gathering crops that we have is red clover, which is also one of the most adaptable for swine feeding purposes. For average conditions the following rotation will perhaps be the most nearly ideal:

ROTATION NO. 1.

Field 1.	Field 2.	Field 3.
1909—Corn and rye	Rye and clover	Clover
1910—Rye and clover	Clover	Corn and rye
1911—Clover	Corn and rye	Rye and clover

It is intended that a part or all of the corn shall be hogged off in the fall. At the last cultivation plenty of rye should be sown. The rye will add to the pasturage somewhat in the fall, while the corn is being hogged off, and should be allowed to ripen in 1910, and fed off without cutting. The clover seed should be sown in the fall, and if a good stand is not obtained a second seeding should be made in the spring. This will give considerable clover forage in the fall of 1910 and clover for forage in 1911. This rotation may be varied in a great variety of ways. For example:

ROTATION NO. 2.

Field 1.	Field 2.	Field 3.
1909—Corn and rye	Rye and rape	Soybeans
1910—Rye and rape	Soybeans	Corn and rye
1911—Soybeans	Corn and rye	Rye and rape

This is essentially the same as the first rotation given, except that instead of clover, soybeans is introduced into the system. Rape is sown with the rye in the spring and lightly harrowed in, and the hogs are rung and turned in when rye is ripe.

ROTATION NO. 3.

Field 1.	Field 2.	Field 3.
1909—Sorghum	Rape, oats and clover	Clover
1910—Rape, oats and clover	Clover	Sorghum
1911—Clover	Sorghum	Rape, oats and clover

Rotation number three is again quite similar to rotation number one, with the exception that sorghum is used in place of corn. This rotation is perhaps more adaptable to the southern portions of the

State. Rape, oats and clover are sown in the spring as soon as danger of frost is over, and are sown in the following proportions per acre: Rape, six pounds; oats, one-half bushel; clover six pounds.

ROTATION NO. 4.

Field 1.	Field 2.
1909—Corn and rye	Soybeans
1910—Soybeans	Corn and rye

This rotation is a two-year rotation. Rye is sown as before at the last cultivation, and is used in the following spring for early forage, and may be used up to June 8 or 10, at which time it is intended to be plowed up and sown to soybeans or cowpeas.

ROTATION NO. 5.

Field 1.	Field 2.
1909—Rape and oats	Cowpeas
1910—Cowpeas	Rape and oats

This is also a two-year rotation and is intended for smaller fields than the other systems given. The rape and oats should be sown in the spring as soon as frost is over, in the following proportions per acre: Rape, six pounds: oats, one-half bushel. In this rotation, if it is desired to have something sown on the land to serve as a soil and fertility binder during the winter, it may be advisable to sow the rape and oats plot late in the fall to rye, which may be used early the following spring for early forage, up to June 8 or 10, when cowpeas should be sown.

Where, in diversified farming, it is desired to introduce a grain crop, not to be fed off as a forage, the following rotation may be advantageous:

ROTATION NO. 6.

Field 1.	Field 2.	Field 3.
1909—**Corn**	Grain	**Clover**
1910—Grain	**Clover**	**Corn**
1911—**Clover**	**Corn**	Grain

The crops in bold face are intended to be fed on the field.

Whenever rape or clover occurs in these rotations care should be taken not to pasture too closely. Rape should not be turned into until twelve to fourteen inches high and should not be pastured off too closely. Leaves are as essential to the health of a plant as lungs are to an animal; and hence, there should always be present an amount sufficient to produce a maximum growth. Clover may be turned onto when five to eight inches high and should for the same reasons not be fed too closely.

The supplements to forages should depend upon the nature of the forage plant. Where the forage crop is a legume, such as alfalfa, clover, cowpeas or soybeans, corn will make a very satisfactory supplement; but where the forage consists of corn, sorghum or rye, better results will be obtained if the grain supplement is made about six parts corn and one part oilmeal.

In the light of the data that has already been worked out, it behooves us as meat producers to alter our methods and introduce more economical systems of pork production. The production of cheap pork with high-priced grains is not impossible if used in connection with succulent forage crops.

SOME COMMON BIRDS ON THE FARM.

(By T. Gilbert Pearson, reprinted from supplement to September Bulletin, 1909, North Carolina Department of Agriculture.)

North Carolina is rich in wild bird life, both in the number of species which is found within her borders and the countless numbers of individuals with which some of the species are represented. The farm lands are supplied the year round with numbers of birds of great value to the agricultural interests. In winter the sounds teem with wild fowl, twenty-six kinds of ducks and seven varieties of geese being known to occur there. During the spring and fall migrations along the beaches are found swarms of plovers, snipe and sandpipers of various names; even the handsome Hudsonian Curlew still comes to us, despite the years of incessant persecution.

About eighty species of native wild birds are known to be permanent residents of North Carolina. Perhaps eighty other varieties come to us in the spring to spend the summer months in our yards, fields, swamps, and on our seashores. Thus about one hundred and sixty kinds of birds are known to nest within the borders of the state. Add to this sixty-five species which pass in the autumn on their long trip southward to spend the cold months in a tropical climate, seventy species at least which come from the frozen north to pass the winter in this latitude, and twenty or thirty birds which have been recorded in the state as stragglers from their usual range, and a total of three hundred and thirty species of North Carolina birds is reached.

If we are to believe what many toiling scientists have revealed, what many state agricultural departments tell us, what the United States Government publications declare, and what we can all see with our eyes if we stop to observe, one great incalculable value of our birds lies in the tremendous number of harmful insects which they destroy and the vast quantities of harmful weed seeds which they consume. It is no small service that a pair of robins render when they honor you by living a summer in your garden, and each day probably eat more than their weight of worms and insects. It is no little thing to have a pair of pewees nest in a tree near your house, and every day for weeks and weeks rid the air of hundreds of harmful insects that seek to destroy the foliage or to sting the fruit of your trees. I once watched a pewee capture sixteen insects during a period of ten minutes, and in company with twenty-five witnesses saw a chipping sparrow one summer seize thirty insects in one minute.

Upon the approach of cold weather many of the birds which have fed largely upon an insect diet, change the character of their food, and during the cold months subsist chiefly upon seeds, with some wild fruit and berries for dessert. Here is where the twenty-five species of native sparrows in North Carolina render their greatest service. They search the fields, eating the grass seeds which abound there. When the snows come and cover this food the tall weed stalks are still holding their stores of grain high above the snow, and to these the birds now turn. Most farmers think they have trouble enough already with the grass and weeds in their growing crops, but it would doubtless be a greater task to keep these subdued if it were not for the assistance of the birds.

Many people have failed to appreciate what a tremendous force the wild birds are for doing good to the agricultural interests of the country, simply from a failure to observe them closely. Many people rarely see wild birds except when the frightened creatures are wildly endeavoring to escape from the real or imaginary enemy who has intruded upon their solitude. But hide in a quiet place, almost anywhere in the fields or woods, and soon the birds come back to their accustomed activities. I have known men who did this to be utterly astounded at what they saw.

While we often fail to give birds credit for the good they do, but few men neglect to condemn them most heartily for any act which may be regarded as detrimental to man's interests, no matter how superficial the data may be upon which the charge is based. For example: I have known farmers, who raised bees, to shoot all the Kingbirds (bee martins) which came upon their premises, because they claimed that the birds sometimes ate bees. Apparently they failed to observe that the Kingbird ate anything else, and that they kept hawks and crows away from the poultry yard. Professor Beal, of the Agricultural Department at Washington, D. C., examined the contents of 218 Kingbirds' stomachs and found that only fourteen contained the remains of bees, most of these being drones, while 68 per cent. of the Kingbirds' food was found to consist of injurious insects.

Again, it is not an unheard-of occurrence for men to order that all robins, catbirds and mockingbirds on their places should be shot, because these birds were seen eating cultivated fruit. But did not the birds perform a great part in helping raise that fruit? Why not do as some men do in the land, who plant a few more trees or vines in order that there may be enough fruit for both the planter and the birds?

To many people there is a very great pleasure in having the birds come to visit them, even if they do eat some fruit and grain. In my garden the past spring a small patch of strawberries furnished some acceptable food for a pair of robins which had a nest in a neighbor's yard, and it was also appreciated by two or three catbirds which came from some place nearby. As soon as the sweet corn was matured the red-headed woodpeckers and a large blackbird (grackle) visited the garden daily. But I had no desire to interrupt them. They were my guests, and by their notes, bright colors and vivacious activities gave pleasure to my family and friends who watched them. Then who would think of taking note of what a guest eats! Besides this, I knew that during the greater part of the year these birds were of much value to my neighbors and me as destroyers of insects.

Some years ago it was a common sight in North Carolina to see men and boys of evenings shooting for mere sport the bullbat or night-hawk. Often they were shot simply for the fun of seeing them fall. I have found these birds, wounded and unable to fly, lying suffering and helpless among the weeds, twenty-four hours after they had been wantonly and thoughtlessly shot down from the air. And yet these birds are so perfectly harmless and so valuable as insect destroyers that in thirty-eight states of the Union they are protected by law.

Whenever man interferes with the laws of nature he is liable to suffer for it. It is one of the divine and absolutely unchangeable laws of nature that birds are set apart to serve as a great natural check upon the hordes of insects which, like a scourge, are ever falling upon the plant life with unabated fury. To kill the birds is to allow these pests to increase. So thoughtlessly and so unceasingly have we killed our birds, that every year in many sections the problem of how to raise crops successfully is becoming a most serious one. From time to time thousands of southern farmers have gathered to discuss the question of what can possibly be done to check the onslaught of the cotton boll weevil. We now know that thirty or forty species feed upon this great plague.

Some of our government experts who have made a close study of the subject of bird destruction and the results, tell us that one-tenth of the entire agricultural products of eastern United States is annually a total loss from the ravages of insects. This percentage, too, we are told, is on the increase, owing to the decreasing numbers of birds. That many birds are far less numerous than formerly, any observant man over forty years of age will readily testify.

The early inhabitants of New England felt that they had a grievance against the blackbirds for eating corn in the fields; so laws were passed offering "a bounty of threepence a dozen for dead maize thieves." Dr. Benjamin Franklin is quoted by Peter Kalm, a Swedish naturalist, as saying that the blackbirds were thus exterminated, "but as in the summer of 1749 an immense quantity of worms appeared in the meadows, which devoured the grass and did great damage, the people abated their enmity for they had observed that those birds lived chiefly on these worms before the maize is ripe, and consequently extirpated them."

Of recent years the study of the relationship of birds to agriculture has revealed many facts which are having a decided influence in changing public sentiment regarding many birds which were formerly regarded as largely if not wholly detrimental. The most marked example is probably in reference to the real value of hawks and owls on the farm. There have been recorded in North Carolina nine species of hawks and eight kinds of owls. Many people have recognized but little distinction between these, and tens of thousands of these useful creatures have been killed by persons who sincerely believed they were doing the country a service. We now know that a very large per cent. of the food of the sparrow hawk consists of grasshoppers and other insects. The red-shouldered hawk feeds to a large extent on field mice, shews, young rabbits and other injurious vermin. To kill a sparrow hawk, therefore, means an increased opportunity for the grasshoppers to eat the grass, and to kill the red-shouldered hawk means that a further invitation is extended to annoying rodents to increase and gnaw the fruit trees or eat the grain in the field. We are very prone to think only of the chicken or game bird which some "chicken-eating" individual hawk takes, and at once condemn all hawks of all species. A wiser course would probably be to make some study of the order of birds known as

Raptores, with a view to learning to differentiate between our enemies and real friends.

Writing of hawks in a recent Year Book of the United States Department of Agriculture, one of the government officials says: "Of late years the acreage under cultivation in the United States has increased rapidly. With increased acreage the number of rodents has multiplied accordingly, because of the abundance of nutritious food and also because their natural enemies have been destroyed by man. The services of hawks and owls were never so much needed as now, and these faithful helpers of man are likely to be more needed in the future; yet thousands of hawks and owls are yearly slaughtered because the part they played in nature's scheme is misunderstood or ignored. Unquestionably, individual hawks that have learned their way to the poultry yard should be summarily dealt with, but because occasional individuals of two or three species destroy chickens it is manifestly unfair to take vengeance on the whole tribe. The very name of 'hen hawk' is a misnomer so far as the bird to which it is chiefly applied is concerned. Moreover, it is made the excuse by the farmer's boy and the sportsman for killing every hawk, large or small, that flies. Thousands of these useful birds are killed annually by thoughtless men for no better reason than that, when sitting motionless, they offer an easy target for the small rifle or, flying, present a tempting mark for the shotgun. So far has popular misapprehension in regard to these birds gone, that again and again states and counties have offered bounties for their heads, thus depleting treasuries and inviting heavy losses to the farmer through the increased number of insects and rodents which it is the function of these birds to hold in check."

The "Audubon Law" now protects at all times every wild bird in the State, also its nest, except game birds in their season, and the following exceptions: English sparrows, hawks, owls, crows, blackbirds, towhees and ricebirds. In days to come, when a more general knowledge of the true importance of birds to the farmer is possessed by the people of North Carolina, many of these birds will be protected by statute and by the still stronger law of public sentiment.

BOBWHITE: QUAIL: PARTRIDGE: (*Colinus Virginianus*).

Male.—Upper parts reddish brown, with broken bands of black; rump grayish brown, finely mottled and with streaks of blackish; tail gray, inner feathers with markings of buff; front of head, a band beneath the eye and line on upper breast black; throat and band over the eye white; sides chestnut, with margins of black and white; belly white, barred with black.

Female.—Similar, but with throat, forehead, and line over eye buffy. In summer both sexes have crown blacker and buffy markings are paler.

Range.—Eastern North America from Maine to Mexico.

Nest.—On the ground in grassy fields or open woods.

Eggs.—White, ten to twenty.

The most popular as well as the most important game bird in North Carolina is without doubt the Bobwhite. Probably more men in the state engage in hunting this bird than are employed in shooting all other kinds of wild birds and animals. Immense numbers are killed every year and sold in the local markets, and many persons, especially in years gone by, have found a profitable business in smuggling them, in violation of the laws, to northern cities. The shooting privileges over large tracts of land in some sections are leased by sportsmen, the farmers receiving in return a remuneration sufficient to pay all their taxes and in many instances considerably more. Over one hundred and eighty thousand acres in Guilford county alone are thus under lease at the present time, and the amount of taxes paid for the shooting rights exceeds $8,000 annually. The lessees kill comparatively few birds, and it is a matter of common observation that the partridge is far more abundant on leased lands than on the adjoining farms where the birds are afforded less protection.

The Bobwhite is a great destroyer of insects during the warm months. He is very found of the chinch-bug, which annually levies a tremendous tribute from the farmers of America. Two tablespoonfuls of chinch-bugs have been found in the crop of one bird. Grasshoppers are credited with doing an annual damage of $90,000,000 to the agricultural interests of the country, and Bobwhite is one of their most deadly enemies. The boll weevil came over the border into the United States in 1894, and was soon costing us $20,000,000 a year. The government collectors have found many partridges whose crops were filled with these weevils, which are secured late in the season when the weevil leaves the cotton and takes refuge in the leaves and rubbish on the ground.

These birds also eat the striped cucumber beetle that does such havoc to cucumbers, squashes and other vegetables. In short, the crops and gizzards examined in great numbers in the government laboratories have yielded fifty-seven kinds of beetles, twenty-seven varieties of bugs, nine grasshoppers and locusts, and thirteen different sorts of caterpillars, besides ants, flies, wasps and spiders.

But the good work of the Bobwhite does not end with the summer. Eighty-five different weed seeds have been found to make up in part his bill of fare. Crops have been found packed with rag-weed seeds and as many as one thousand seeds of the crab-grass have been taken from one bird. A specimen shot on Christmas day of 1901 at Kinsale, Virginia, contained about 10,000 pig-weed seeds. In Bulletin 21 of the Bureau of Biological Survey, we read: "It is reasonable to suppose that in the states of Virginia and North Carolina from September

1 to April 30 there are four Bobwhites to each square mile of land, or 354,820 in the two states. The crop of each bird holds half an ounce of seed and is filled twice a day. Since at each of the two daily meals, weed seeds constitute at least half the contents of the crop, or one-fourth of an ounce, a half-once daily is consumed by each bird. On this basis, the total consumption of weed seeds by Bobwhites from September 1 to April 30 in Virginia and North Carolina amounts to 1,341 tons."

The above facts and figures may well be used in argument to substantiate the claim by many people that the time has arrived when our beloved partridge is of far more value to us while living than after he is dead.

NIGHTHAWK: "BULLBAT:" (*Chordeiles Virginianus*).

Male.—Upper parts black, with markings of white and buff. Wing crossed by broad white bars; tail black or nearly so, with broken bars of buff, with white band at end on all but middle feathers; white throat; chin and breast black; belly barred with black and white.

Female.—No white on tail and washed with buff below.

Length.—Ten inches; expanse of wings, 23 inches.

Range.—Eastern North America; breeds from the Gulf States to Labrador; winters in South America.

Nest.—On the bare ground in fields or open woods, sometimes on flat-topped houses in cities. Eggs heavily spotted and blotched, closely resembling the ground; two in number.

The Goatsucker Family is represented in North Carolina by three distinct species. These are the Chuck-wills's Widow, which is confined chiefly to the eastern portion of the state. It is the largest of the three. The Whip-poor-will, which is of pretty general distribution, is the second species, and the third is the Nighthawk or "Bullbat," known to all observers of bird life from the coast to the highest mountain regions. Because of the fact that the activities of these birds are largely nocturnal, much confusion has arisen as to their identification, and the writer has for many years been familiar with the query, "Are the bullbat and the whip-poor-will the same bird?' " The whip-poor-will, although about the size of the nighthawk, appears in flight to be heavier. This is probably on account of the wings being shorter. From tip to tip the wings of an average specimen measures seventeen inches, while the same measurement made of a typical nighthawk shows twenty-three inches. The whip-poor-will is decidedly a night bird and rarely makes its appearance before late dusk. Its eggs are deposited usually on old leaves, generally to be found on the ground in a thicket, while the nest of the nighthawk is a smooth place on the bare ground, either in the *open* woods and fields. All of the representatives of this family feed upon insects, which they capture while on the wing. Hence the approach of winter necessarily drives them to the far south, where an insect diet may be procured.

The United States Department of Agriculture in its study of the feeding habits of birds had 87 nighthawks killed and the contents of the stomachs examined. One of the most conspicuous elements of food was found to be flying ants. In twenty-four individuals the number counted ranged from two hundred to eighteen hundred. While some ants at times have useful functions, they are as a whole annoying and harmful insects. The work done by the nighthawk in destroying the flying ant is doubly important, as it occurs just at the epoch in an ant's life when it is preparing to propagate its kind. The death of an ant at this time means the loss of hundreds or perhaps thousands of the next generation. Nighthawks eat many grasshoppers. One stomach held the remains of sixty individuals. This was probably the remains of several meals, as indicated by the presence of the mouth parts, which alone had remained in the stomach. Numbers of the birds were found to have eaten May beetles and others had consumed potato beetles. Bugs of the chinch-bug family, leaf-hoppers, and many soft-bodied dipterous insects were discovered, as well as the remains of many small insects like mosquitoes, but not fully identified.

It is evident that the nighthawk is one of the most valuable birds, and the law which protects them should at all times be carefully observed. The man who watches these birds flying about over his farm of an evening may feel well assured that they are friends and will do him no harm, but rather much good.

BROWN THRASHER.

Rufus brown above, except the tips of the wing covert, which are whitish. Below the bird is white, streaked (except on the throat and belly) with black. Length near 11½ inches.

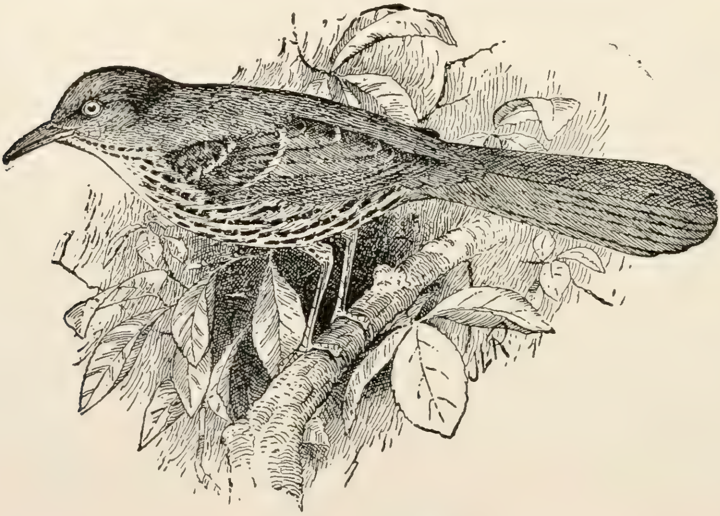
Range.—Eastern United States; breeds from Florida to Maine.

Nest.—Composed of twigs, small roots, pieces of grapevine, or other similar material, and lined with fine rootlets. It is placed in thickets, bushes, or, rarely, on the ground.

Eggs.—Generally, four in number, the ground color of light gray, thickly speckled, covered with brown.

This has been a familiar bird with the most of us since our earliest school days, when we heard the children recite the classic verses beginning: "There's a merry Brown Thrush sitting up in the tree." Although it is a comparatively common bird throughout the state in summer, many individuals retire southward upon the approach of cold weather, and it is probably very rare west of Releigh during the winter weather. I saw one at Chapel Hill January 2, 1899, and the date would seem to indicate that it had taken up its abode there for the winter.

Being largely a ground-inhabiting species, the Brown Thrasher naturally feeds upon a great many insects which can be gathered there. They are known to destroy cutworms, cankerworms and caterpillars of many kinds. Grasshoppers, crickets, grubs and beetles are eaten. Dr. Sylvester Judd of the United States Department of Agriculture, has given an interesting summary of the contents of 121 stomachs of the Brown Thrasher which he has examined. He states that 36 per cent. of the food was vegetable and 64 per cent. was animal. It eats much wild fruit and occasionally cultivated fruit is attacked. Besides weed seeds of various kinds the bird comes to the borders of the fields and picks up stray grains of corn dropped in harvesting season. It also frequents public roads and gathers grain scattered in the dust. Locally, and, so far as I have ever been able to learn, sparingly the Thrasher pulls up sprouting corn and other grain. One hears very little complaint of this, however, and the bird is regarded of sufficient value to be protected at all times by the law of the State.



BROWN THRASHER.

(After Beal, Farmers' Bulletin No. 54, Office of Experiment Stations, U. S. Department of Agriculture.)

The Thrasher consumes a tremendous amount of food daily. The writer was especially impressed with this fact a few years ago while watching a pair of the birds feed their young in the yard of Mr. Robert U. Garrett, at Asheville. The nest was in a thorn bush about seven feet from the ground and directly in front of my window, which gave me abundant opportunity for observing the actions of the parent birds.

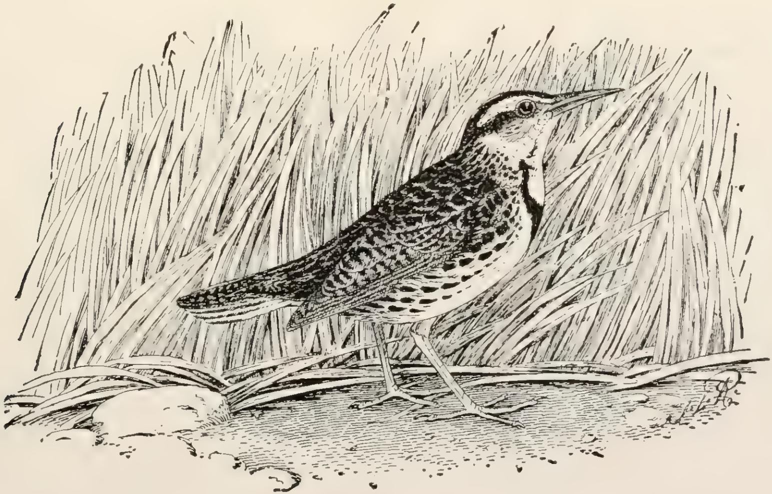
They began feeding their young before 6 o'clock in the morning and continued until about 8 in the evening. Through my field glasses I determined the fact, for the birds often alighted near me, that they sometimes carried two or three insects or worms at once. I watched them for hours on different days and, keeping careful record, found that one parent averaged a trip to the nest with food every ten minutes and the other bird averaged one every *two and one-half minutes.* If they did this during the entire fourteen days the young were in the nest, counting that they carried only one article of food each trip, it would mean that the young were fed 6,880 worms and soft-bodied insects before they ever left the nest. Doubtless 50,000 or 75,000 insects were destroyed by that one Thrasher family the summer of 1902

MEADOW LARK (*Sturnella magna*).

Upper plumage brownish, with dark-streaked, pale-edge feathers; outer tail feathers with much white; a light yellowish line from the bill down the top of the head and a similar stripe over the eye; a dark line behind the eye; yellow below with a large black crescent on breast; sides lighter with prolonged black spot. Winter plumage: feathers of black more widely margined with brown, giving a suggestion that brown is the prevailing color; the yellow of the plumage duller; length, 10¾ inches.

Range.—Eastern North America; breeds from the Gulf of Mexico to New Brunswick.

Nest.—Of grasses, usually arched over; located on the ground, often beneath a bunch of grass or small pine sapling.



MEADOW LARK.

(*After Beal, Farmers' Bulletin No. 54, Office of Experiment Stations, U. S. Department of Agriculture.*)

The Meadow Lark, or Old Field Lark, or, as it is often called, "Fee Lark," is a familiar acquaintance of virtually every farm boy in the state. Its loud, clear call in the spring is known to all whose business or pleasure takes them to the fields. Its clear, far-reaching whistle of "laziness will kill you," is enough to arouse in the mind of the hearer more than a passing notice. It is a common bird throughout eastern United States in the summer months, and winter finds it still inhabiting most suitable localities from the District of Columbia southward. Living as it does on the ground, it is seldom seen perched aloft unless for the purpose of singing, or when resting after its search for food. In flying it proceeds by alternately sailing and beating its wings rapidly. The nest is an oven-like structure concealed under a tuft of grass or small bush, and the eggs, which are four or five in number, are beautifully spotted from Nature's bounteous palette.

The Lark is essentially a bird of the fields, but in the open pine woods of the east it finds a territory suitable for its occupancy. When on the ground it does not hop like many small birds, but walks like a crow or chicken, occasionally expanding its tail feathers with a sudden jerky movement, which displays well the outer white tail feathers of that member.

Our Meadow Lark is a decidedly handsome bird, and probably in part for this reason and because it affords a rather easy mark for the gunner, many are shot for the mouthful of flesh to be found beneath their beautiful feathers. A parasitic worm, often found in the small of the back, deters many experienced persons, however, from pursuing the bird persistently.

Few birds are more constant eaters of insects than the Lark. Even in winter when snow lies thickly on the ground many stomachs have been found to be filled largely with insects which have been procured about manure piles, the edges of straw stacks and similarly exposed places. Two hundred and thirty-eight Meadow Lark stomachs were examined by the United States Biological Survey. They had been killed in various localities and at all seasons of the year. The object of the experiment was to determine as accurately as possible the facts regarding the bird's food. The results were carefully tabulated and the following interesting results were obtained:

Months.	Stomachs examined.	Animal food.	Grain.	Weed seeds.	Totals.
January	13	24.36	75.28	.36	100
February	1	.00	25.00	75.00	100
March	12	73.14	17.00	9.86	100
April	28	77.51	15.10	7.39	100
May	8	97.99	1.88	.13	100
June	20	95.79	2.10	2.11	100
July	18	97.32	.00	2.68	100
August	28	99.35	.00	.65	100
September	29	99.20	.40	.40	100
October	40	94.39	.61	5.00	100
November	22	77.08	6.50	16.42	100
December	19	39.22	32.70	28.08	100
Year	238	72.95	14.71	12.34	100

The above shows that nearly three-fourths of the Meadow Lark's food for the year consists of insects, about 12 per cent. of weed seeds, and 15 per cent. is grain. The record of grain may raise a question as to the bird's possible injury to crops. A glance at the table, however, shows that almost the entire amount of grain was eaten during the months of December, January, February, March and April, and was apparently largely gleaned from the stubble fields. The following is a list of the insects identified from these stomachs:

No. 1.—*Orthoptera.*

Red-legged grasshoppers,
Meadow grasshoppers,
Other grasshoppers,
Crickets.

No. 2.—*Coleoptera.*

Weevil,
Billbug,
Curculio,
Clover weevil.

No. 3.—*Lepidoptera.*

Butterflies,
Moths,
Cutworm,
Army worm.

No. 4.—*Hemiptera.*

Stilt bug,
Soldier bug,
Assassin bug,
Chinch-bug,
Spittle insects,
Tree hoppers,
Jumping plant-lice,

Fire-fly family.
Lady birds,
Scarred snout bettle,
Leaf-eating beetle,
Flea beetle,
Darkling beetle,
Rove beetle,
Longcorn beetle,
Tiger beetle,
May beetle,
Ground beetle,
Click beetle.

No. 5.—*Hymenoptera*

Ants,
Wasps,
Stinging ants,
Ichneumon flies.

No. 6.—Miscellaneous Animal Food.

Ticks,
Snails,
Thousand-legs,
Small batrachians,
Sawbugs,
Spiders and cocoons.

It is rather a remarkable fact that the Lark, being a ground-feeding bird, should destroy so few beneficial insects. This may possibly be explained by the fact that many of the useful kinds have a disgusting odor. The one fact alone that the bird eats chinch-bugs is enough to make us his friend forever, for we cannot lose sight of the fact that this troublesome bug in the United States during the past half century has destroyed grain to the estimated value of over $330,000,000. Of late it has also been discovered that the Lark is a wonderful enemy of the boll weevil. Professor Beal of Washington, D. C., estimates that in the great hay-producing sections of the country this bird annually saves two and one-half tons of hay in each township as a result of destroying grasshoppers.

But the story of the good which the Meadow Lark does is not yet all told. We noticed that it eats weed seeds. Here are some of the seeds found in the stomachs of those 238 specimen birds:

Pigeon grass,
Panic grass,
Smart weed,
Rag weed,
Gromwell seed,
Black mustard,
Bayberry.

What a wonderful record for good the Meadow Lark has to its credit. Does it occasionally pull up some sprouting grain? Such statements have at times been in circulation. However, this may be, careful observers all appear to unite in voting it a good and useful bird, and in nearly all States in the Union it is guarded by statutes the year through. The following states only have not as yet enacted laws for its protection, viz.: Florida, North Carolina, Georgia, Alabama, Louisiana, Tennessee, Missouri and Idaho.

THE WOODPECKERS.

In North Carolina the following species and climatic varieties of woodpeckers are today recognized by naturalists:

Hairy Woodpecker (*Dryobates villosur,* Linn).
Southern Hairy Woodpecker (*D. v. audubonii,* Swains).
Downy Woodpecker (*Dryobates pubescens,* Linn).
Red-cockaded Woodpecker (*Dryobates borealis,* Vieill).
Yellow-bellied Sapsucker (*Sphyrapicus varius,* Linn).
Pileated Woodpecker, "Logcock" (*Ceophlocus pileatus,* Linn).
Red-headed Woodpecker (*Melanerpes eruthrocephalus,* Linn).
Red-bellied Woodpecker (*Melanerpes Carolina,* Linn).
Flicker: "Yellow Hammer:" (*Colaptes auratus,* Linn).

Woodpeckers are, as a rule, solitary birds, and are seldom seen associated in greater numbers than the individuals of one family. They are wonderfully adapted for performing their part in the economy of nature, which is to guard the trunks and limbs of trees from the undue increase of insects. All our woodpeckers are provided with four toes on each foot, two of which point forward and the other two backward. This arrangement gives them great power in clinging to vertical surfaces of trees. They are also aided by the stiff tail feathers, which serve as a sustantial brace beneath. The stout chisel-like beak enables them to rapidly dig larvae from the bark and wood and also provides them a means of readily excavating their nesting cavities. Woodpeckers have no power of song, their method of attracting the attention of others of their kind being a few calls and a loud tattoo beaten by the bill on some resounding limb, loose shingle, or tin coping of a house. All lay pure white eggs and deposit them on a thin layer of fine chips in the bottom of their nesting holes.

Many farmers look with the eye of suspicion upon the movements of woodpeckers when seen frequenting fruit and shade trees and pecking holes in them. Close observation reveals the fact, however, that these birds rarely injure a healthy tree, and with the exception of one species the holes they make seem to be almost entirely for the purpose of dislodging and devouring wood-loving larvae.

The following are perhaps the four best known species in the State:

DOWNY WOODPECKER (*Dryobates pubescens*).

Upper plumage black, with (in the male) a red band across the back of head; middle of the back white; wings spotted with white; the outer tail feathers barred with white. There is also a white stripe above and one below the eye. Length, about 6¾ inches.

Range.—Eastern North America from the Gulf to Labrador.

Nest.—In cavities of trees.

Eggs.—Four or five, glossy white.

The Downy, which is the smallest of our woodpeckers, is the common little "Sapsucker" seen in summer, frequenting the woodlands, orchards and shade trees. Often one detects its presence first by hearing the busy *tap, tap,* of his bill as he works industriously at his daily task of collecting grubs and larvae. He is especially attracted by neglected orchards where the old trees harbor a vast number of insects and tree vermin. The Downy is fond of the society of other small birds, and after the summer household duties are finished may frequently be seen in company with nuthatches and chickadees. Often these merry parties are joined by flocks of bright-colored warblers during their fall migration, and for days such avian bodies may be seen associated pleasantly. This bird usually excavates a hole in some dead limb as the cold weather approaches, to be used as a roosting place in winter.

The relation of the Downy Woodpecker to the orchard has been made a subject of careful study by a number of naturalists. One of the interesting observations made is that it pierces great numbers of cocoons of the codling moth, which are usually concealed under flakes of bark and thus escapes the observation of many other birds. It destroys the wood-boring beetles and their larvae in great quantities, and possesses the wonderful faculty of being able to locate with great accuracy the exact spot at which to dig with the least labor to secure its prey. It also eats many bark beetles and weevils and is a large consumer of the round-headed apple borer which infest fruit trees.

It is a well-known fact that a favorite place for the wooly aphis is at the scars made by pruning. Here they are often found in clusters, and some entomologists are of the opinion that their presence greatly retards, if it does not even prevent, the speedy healing over of these wounds. The Downy greatly enjoys the flavor of the wooly aphis.

This woodpecker at times has the habit of making large numbers of holes in the bark of apple trees. These are generally not over an inch apart and are arranged in parallel rows around the tree. The holes are round, which distinguish them from the holes made by the real Sapsucker, which will be discussed later. As this work is done in the autumn when the sap is not running, it is evidently not that fluid which the bird is seeking. If this is not done to secure the insects, but to obtain some portion of the tree, it is evidently the cambium layer of the bark. The writer has examined scores of fruit trees on which the Downy has thus demonstrated his ability as a chiseler of bark, but has never seen one which died from the attacks. In fact, one close observer declares that the trees thus favored with the Downy's attentions seem to be actually invigorated rather than injured.

The amount of work which this bird is capable of doing in a day is truly wonderful. Mr. Vernon Bailey of Washington, D. C., once watched a bird of this species as it went about its daily toils. He found that between the hours of 9:40 a. m. and 12:15 p. m. it traveled about over one hundred and eighty-one trees and made twenty-six separate excavations for food.

All persons interested in the preservation of forests must be friends of this bird. It eats the very destructive bronze birch borer, the maple borer and the pine weevil. This last-named insect infests particularly the buds of the topmost shoots of pine trees, thus causing the tree to constantly send out side shoots, which, of course, makes a crooked tree and largely destroys its value for lumber.

Although about three-fourths of the food of the Downy has been shown to consist of insects, it eats in their seasons certain berries and wild fruits. It has been known to feed upon buds and petals of flowers, wild strawberries, pokeberries, poison ivy berries, sumac berries and beech nuts.

FLICKER: "YELLOW HAMMER:" (*Colaptes auratus*).

Upper parts brownish gray, barred with black; rump white; top of head ashy gray, a scarlet band (in the male) across the back of head; inner surface of wings yellow; tail black above, yellow below, with black tip; a broad black crescent on breast; belly and sides thickly spotted with black. Length, about 12 inches.

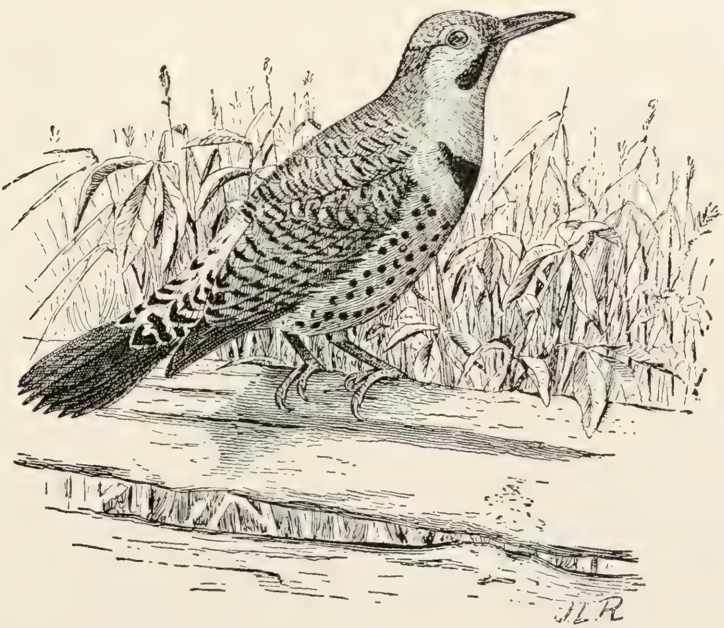
Range.—North America, west to Rocky Mountains and north to Alaska.

Nest.—In cavities of trees.

Eggs.—Four to seven, glossy white.

No bird in America has so many local names as the Flicker. Some of these are Higholder, Wake-up, Walk-up, Pigeon, Woodpecker and Yawker-bird. At Cape Hatteras it is generally called Wilchrisen. It is one of the best known of our native birds, and this fact, together with its loud, characteristic calls, has doubtless given rise to the various names by which it is known. The Flicker is exceedingly sociable at times, and has the habit of entering the barns and other outbuildings. While a student at the University of North Carolina I knew Flickers to frequently go into the New East Building through open windows. There is a church in the woods on Roanoke Island, or was some years ago, which the Flickers often entered. They also dug many large holes in the posts which supported the roof of the porch in front. I know of no reason for this habit of going in buildings. Perhaps it is in quest of food, maybe it is out of simple curiosity, or possibly it is in an endeavor to find some snug winter quarters, away from the cold winds.

Although the Flicker is a true woodpecker, it is far more of a ground-feeding bird than any other species of this family. They may often be started from the ground in the fields or open woods where they have been feeding on grasshoppers or other insects.



FLICKER.

(After Beal, Farmers' Bulletin No. 54, Office of Experiment Stations, U. S. Department of Agriculture.)

The Bureau of Biological Survey of the United States Department of Agriculture examined carefully the contents of 394 Flickers' stomachs taken in 28 states, including Canada. It was found that about 50 per cent. of their food consists of ants. The tremendous number of these troublesome little pests which are killed, may be illustrated by the fact that two stomachs were found to contain over 3,000 ants each. Flickers also eat various insects and occasionally fruit in limited quantities. The fruit and berries consumed appears to be largely wild in character, as shown by the following list of vegetable food found in the northern Flickers examined:

Cultivated cherry,
Choke cherry,
Wild black cherry,
Elder,
Dogwood,
Cornel,
Pepperidge,
Virginia creeper,
Hackberry,
Poison sumac,
Poison ivy,
Sumac,
Black alder,
Smilax,
Blackberry,
Raspberry,
Waxmyrtle,
Blueberry,
Pokeberry,
Service-berry,
Magnolia,
Wild grape,
Huckleberry,
Mulberry,
Spice-bush,
Cedar,
Sassafras,
Persimmon,
Apple,
Pear,
Seeds,
Sweet fern,
Polygonum,
Clover,
Mullein.

The services which Flickers render in destroying the ground-inhabiting ants may be better appreciated by looking carefully into the relationship existing between ants and the destructive plant-lice with which their lives are curiously associated. The world-known scientist, Professor Comstock, in his "Manual of the Study of Insects," says:

"It is easy to see what benefit ants derive from this association with plant-lice, and how they should learn that it is worth while for them to care for their herds of honey-producing cattle. Little has been done, however, to point out the great benefit that accrues to the plant-lice from this relationship. It seems fair to assume that the plant-lice are greatly benefited, else why has the highly specialized apparatus for producing the honey-dew been developed?

"Writers long ago showed that ants protected plant-lice by driving away from them lady-bugs and other enemies. Recently, however, Professor Forbes has demonstrated that, in certain cases at least, a more important service is rendered. In his studies of the corn plant-louse he found that this species winters in the wingless, agamic form in the earth of previously infested corn fields, and that in the spring the plant-lice are strictly dependent upon a species of ant, *Lasius alienus,* which mines along the principal roots of the corn, collects the plant-lice, and conveys them into these burrows, and there watches and protects them. Without the aid of these ants the plant-lice were unable to reach the roots of the corn. On page 631 it is stated: 'Ants take very good care of their cattle (aphids), and will carry them to new pastures if the old ones dry up. They also carry the aphid-eggs into their nest and keep them sheltered during the winter, and then carry the young plant lice out and put them on plants in the spring.'"

Mr. William Dutcher, president of the National Association of Audubon Societies, writes: "If the Flicker had no other valuable economic quality, it would deserve protection because it is an enemy of the ant family."

RED-HEADED WOODPECKER (*Melanerpes erythrocephalus*, Linn).

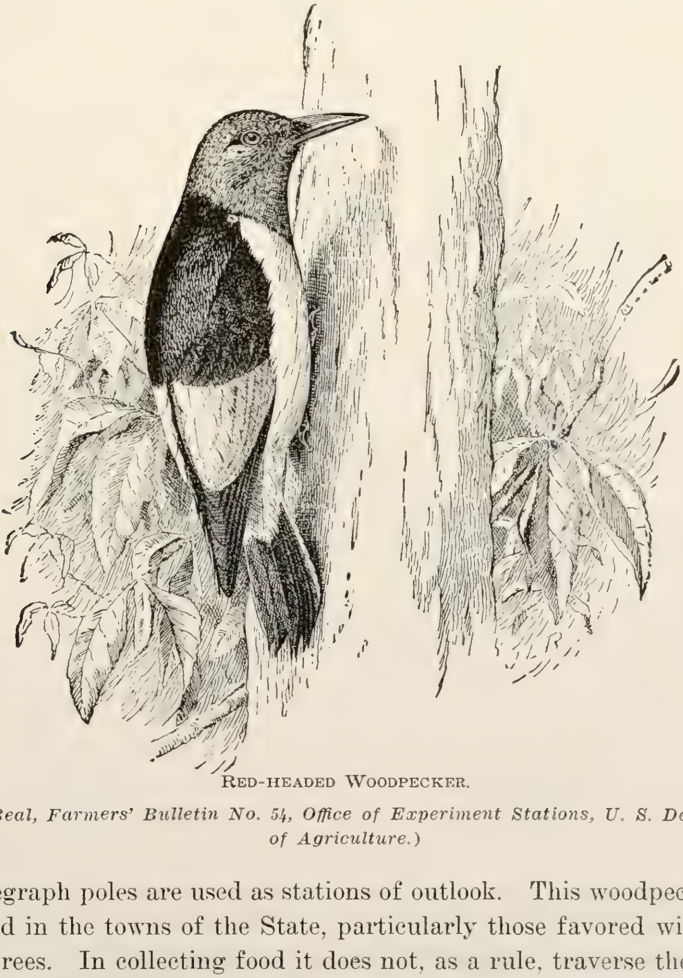
Adult: head, neck and throat red; general upper plumage bluish black, except rump, upper tail coverts and portion of wings, which are white; lower breast and belly white. In first plumage young have grayish brown head and neck, and irregular bars of black on white of the wing. Length, about 9¾ inches.

Range.—Breeds from Florida to New York; winters from Virginia southward.

Nest.—In cavities of trees or poles.

Eggs.—Four to six, glossy white.

Throughout the larger portion of North Carolina the Red-headed Woodpecker is a more or less common resident. It inhabits cultivated fields in many places, and its usual perch is on an upright fence stake or a dead tree in some clearing. It is often seen along railroads, where the telegraph poles are used as stations of outlook. This woodpecker also is found in the towns of the State, particularly those favored with large shade trees. In collecting food it does not, as a rule, traverse the trunks and limbs of trees after the manner of the Downy, or dig in the earth like the Flicker. While at time it catches insects on the bark of trees,



RED-HEADED WOODPECKER.

(*After Beal, Farmers' Bulletin No. 54, Office of Experiment Stations, U. S. Department of Agriculture.*)

and seizes grasshoppers and beetles in the grass, its favorite method of the chase is to dart out from some post of observation and capture passing insects on the wing, as do the Kingbird and Pewee. In considering the economic value of a bird as a destroyer of insects, there must be borne in mind the fact that not all insects are injurious to man's interests and some are of real value. The Red-head is known to kill certain beneficial forms, such as tiger beetles and various predaceous ground species. It has also been accused of killing the young of other birds, although there appears to be little data on which to found an opinion that this habit is widespread or universal. Its vegetable food is varied, consisting mainly of fruit, berries and beech nuts. The writer has often seen it feeding upon acorns of various kinds, and there is a pretty common belief that at times it stores acorns for winter use in convenient crevices of trees or posts.

YELLOW-BELLIED SAPSUCKER (*Sphyrapicus varius,* Linn).

Top of head scarlet; back barred with black and yellowish white; white spots on wings; white line under eye; throat red (white in female); breast black, belly yellowish white; sides streaked with black.

Range.—Eastern North America; breeds generally from the higher North Carolina mountains northward. Winters from Virginia to Central America.

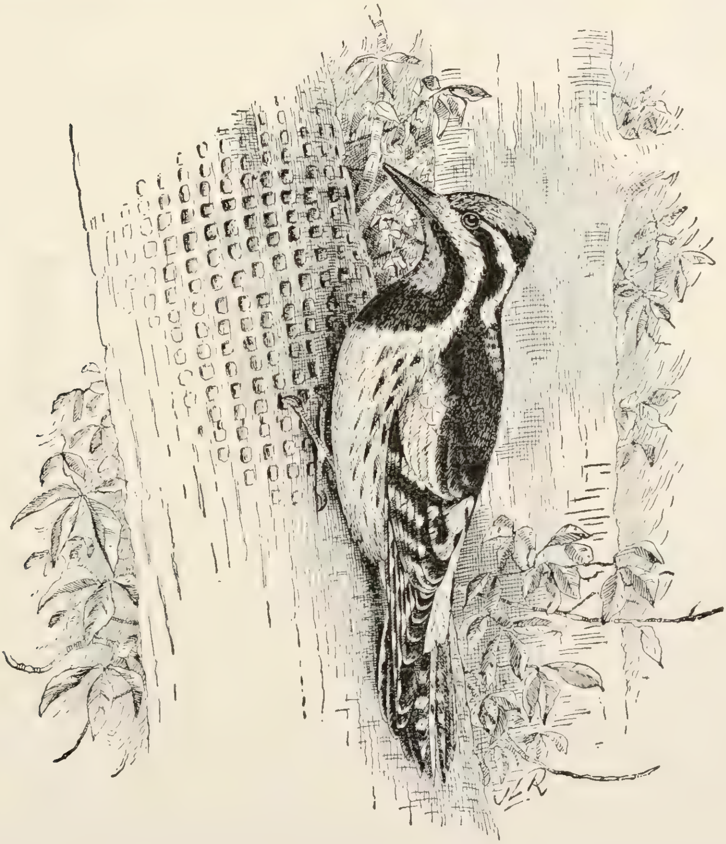
Nest.—In cavities of trees.

Eggs.—Five to seven, glossy white.

The Sapsucker is generally seen in North Carolina about the time of the first cold days of autumn. It is decidedly retiring in its habits, and one may live a week among the trees of the barn-lot without being noticed. It haunts the trunks of trees, appearing to prefer those of dense foliage. The male may be readily distinguished from the other smaller woodpeckers by the bright red feathers of the throat.

The Sapsucker's food consists in part of many varieties of such wild berries as it is able to find in the autumn and winter. It eats insects when these are accessible. Its chief diet, however, consists of the inner layer of bark of a variety of trees and the sap which it is enabled to collect by means of numerous small holes excavated through the bark for this purpose. Among other trees, it is known to attack the apple, sugar maple, mountain ash and hemlock. In the spring of 1891 I watched with much care the actions of a Sapsucker, and the following brief account of what occurred is taken from the writer's book, "Stories of Bird Life:"

"For several years a Sapsucker (possibly not the same bird always) has each season visited a small balsam growing in a frequented lawn near my home. In the autumn it begins its attack and a few small holes are dug through the bark, but by far the larger amount of his work is done in the spring. This year when the sap first began to rise the Sapsucker came out of the woods and commenced operations on the balsam. He is a wonderful carpenter, and the way he made the chips fly with his sharp bill was astonishing. Hour after hour he toiled on, cutting scores of holes through the bark to the solid wood beyond. In a few days hundreds of these little wells had been sunk and the sap rose in them in abundance.



YELLOW-BELLIED WOODPECKER.

(After Beal, Farmers' Bulletin No. 54, Office of Experiment Stations, U. S. Department of Agriculture.)

"The bird would cling to the side of the tree, braced by his tail, and drink the sweet juice from the holes, one after another. As they ran dry, day by day, other holes were chiseled. Usually these openings were made in rings about the tree or in rows up and down its side. I counted forty-two holes in one vertical line. These were mostly about the size of a lead pencil, but a few were an inch and a quarter long and three-fourths of an inch wide. Some of the holes are less than a foot from the ground, and they occur at intervals for twenty feet, or fully two-thirds the distance to the top. The perforations were confined chiefly to the trunk of the tree, and in only one case was a limb assailed.

"During the month of March new holes were made daily, and on the 29th the bark showed 1,671 unhealed openings, which had been made this spring. Hundreds of old scars bear mute testimony to the workings of the Sapsucker in previous years."

Trees which have been attacked by the bird sometimes die, but the one referred to above is now (September, 1909) still alive and flourishing.

ENGLISH SPARROW (*Passer domesticus*, Linn).

General color suggests grayish chestnut; back streaked with black; top of head gray and rump gray, whitish below, except throat and breast (in male only) black. Length, about 6½ inches.

Range.—A large part of Europe and Asia. Naturalized in America, New Zealand, Japan, Australia, and elsewhere.

Nest.—Sticks, twigs, grass and feathers, and situated in any available place.

Eggs.—Four to six, finely and evenly spotted.

It was in the year 1851 that the English Sparrow was introduced into America. They were liberated first in Brooklyn, N. Y., and later in other eastern cities. Many thought the bird would prove a great friend to man by destroying caterpillars which infested the trees of the parks and gardens. In this the stranger was largely a failure; but as a fighter of other birds, a disturber and broiler of the town, and a general all-round nuisance, he has been a pronounced success. His unprepossessing manner, his habit of feeding among filth, his rolling in the dust of the city streets, and his harsh, never-ending chirps, have all combined to bring upon his head the abuse of a long-suffering nation.

This sparrow is exceedingly hardy and is apparently little affected by climatic conditions, being equally at home in the biting winds of a Quebec street or panting in the throbbing heat of a Tampa housetop. Because of their wonderful adaptability to environment the species has spread with marvelous rapidity throughout North America, although in many sections they are as yet confined to the towns and cities. Traps, poisons and guns are brought to bear upon them in untold numbers, but the English Sparrow holds its own and defiantly builds its nest in the veranda trellis, roosts behind the window blind, and at the peep of day shouts its "get up" call to its sleepy tormenters.

Occasionally one meets with a friend of the sparrow who, if he be a gardener, will tell of the cabbage worms which this bird destroys; or, if he be a farmer, he may show you in dollars and cents how the sparrow has been worth his weight in silver by eating the worms from his tobacco plants. Such friends, however, are rare. On the whole, he has been voted a nuisance by nearly all the state legislatures in the Union, and chiefly on account of his presence, Congress has enacted a law prohibiting the importation to America of any wild birds or animals without the consent of the proper government authorities. The effect of the English Sparrow on American bird life has thus become a most pronounced one. One should be careful not to confuse this imported species with any of our native sparrows, all of which are of the first importance as destroyers of insects and consumers of noxious weed seeds.

BLUEBIRD (*Sialia sialis*, Linn).

Upper parts bright blue; throat, breast and sides dull brick-brown; belly, white. The blue of a female has a grayish tinge, and colored underparts are paler.

Range.—United States and Southern Canada.

Nest.—Of grass, in bird boxes or holes of trees and stumps.

Eggs.—Four to six, pale blue, sometimes white.

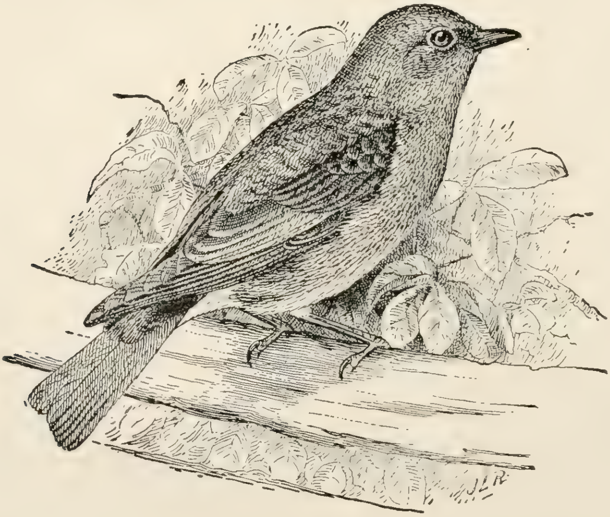
Early in the year 1895 a prolonged cold spell, accompanied with an abundance of snow and ice, restricted the food supply of the Bluebird to such an extent that large numbers succumbed to famine and cold. As many as fifteen individuals were found dead in a single hollow of a tree in Guilford county. For several years after this catastrophe a question often heard was: "What has become of the Bluebird?" Normal food and climatic conditions are again resulting in the bird once more assuming something like its usual numbers.

The Bluebird seems equally at home in the farmyard or in the field or open woods, remote from human habitation. Always it is the same cheerful, inoffensive little creature, whose very appearance is calculated to cheer the heart. They mate early in the spring, are affectionate parents, and care well for their young.

It is said that geese, swan, eagles and some other birds mate for life, and if one is killed the survivor will rarely mate again. The Bluebird does not take matrimonial matters so seriously. The writer one spring placed a bird box on a tree in a yard near where two Bluebirds had made their appearance. They at once took possession of it, and in time four blue eggs were deposited. Then a cat climbed the tree and caught the female on the nest. The male was much distracted the next day and mourned constantly for his loss. The day succeeding, however, he found a second mate. She laid five eggs and in turn suffered the same fate as the preceding female. Then I shot the cat. A third wife built her nest in the box and successfully reared her young.

People living in towns, unfortunately, do not have the pleasure of the Bluebird's company as much as in former years. This is due to the inroads of the English Sparrow. My observation has been that in a fair fight the Bluebird can hold its own with the doughty little Britishers, but nevertheless, sooner or later, the latter usually become master of the situation, and the Bluebird retires to the more peaceful environment of the open country.

So far as is generally known, the Bluebird does not steal fruit or eat the crops of the farmer. Its vegetable food consists of the berries of the poison ivy, cedar and such other vines and trees as provide food for birds during the winter. I have seen it eat mistletoe berries. In the Bureau of Biological Survey at Washington the contents of 300 Bluebirds' stomachs showed that 76 per cent. of their food for the entire year consisted of insects and their allies; 28 per cent. of their food was beetles of various kinds. The bird is a great destroyer of grasshoppers, and during August and September 60 per cent. of its diet is of this character. The Bluebird appears to be popular and beneficial wherever found, and should be encouraged at all times to dwell on the farm.



BLUEBIRD.

(After Beal, Farmers' Bulletin No. 54, Office of Experiment Stations, U. S. Department of Agriculture.)

HOW TO ATTRACT BIRDS.

Much may be done with a very little trouble to induce many species of wild birds to come about the house. A short observation is sufficient to demonstrate the facts relative to what birds really require if they are to stay about you. The conditions plainly necessary are: First, food; second, reasonable security from enemies; third, suitable nesting places. Much food may be provided about a farm by simply letting Nature have her own way to a degree. Do not cut down all the wild cherry trees; leave a few for the birds. Let some blackberries grow here and there. If a haw or sumac is growing near the house do not remove it. Plant a few sunflowers in the corner of the garden or along the edge of the field; they will take up little space and yield abundant food for the chickadee, goldfinch, titmouse, nuthatch and cardinal. In winter a little beef or sheep fat tied to the limb of a tree will be deeply appreciated by the Downy Woodpecker and Titmouse. A little broken refuse grain and chaff in winter will likewise furnish comfort to the snowbirds and various native sparrows, if it is thrown out where they can get it.

ONE OF THE FARMERS' BEST FRIENDS. (See page 270.)

Birds do not care to remain long about a house if there is grave danger from enemies. The most terrible of all destructive agencies to the average farmland bird is the domestic cat. This creature pounces with great frequency on the birds while they are feeding or hopping along the ground; it catches innumerable young, shortly after they have left the nest and are as yet unable to fly; it eats the little ones in the nest or catches the old one as she broods by night. All extra and stray cats about a house should be killed, not sent away to plague some other neighborhood; it is a mercy to the cats and a help to the birds.

Birds need cover into which they can dart upon the sudden appearance of a hawk, cat or other enemy. Cedar trees, honeysuckle vines, or other shrubbery afford them much protection.

If we would see birds to the best advantage in summer we must have them nesting not far away. If suitable places can be found, many birds prefer to build their nests somewhere near the homes of man. If the veranda has a climbing rose the Yellow Warbler will often build in it. The Thrasher will nest in the brush-heap or in the mass of vines in the back lot or fence corner. By putting up a small box on a pole the Bluebirds will accept the invitation of free rent and will pay you handsomely for your favor by catching thousands of insects in your garden. Gourds or boxes on high poles will, in many parts of the State, attract colonies of Purple Martins that will drive hawks away from the chickens and rid the air of many insects.

So much good will result to the man who is kind to the birds, it is a great wonder all persons do not realize the fact and profit thereby.

INSTALLING A PRIVATE WATER SYSTEM.

(W. B. Wallace, Bunceton, Mo.)

Just why a farmer, and especially one who is devoting much of his time to the breeding of Big Boned Poland-Chinas, should be asked to write an article on the installing of a private water system in a farm home I do not know. However, if the addition of complete systems of running water in the farm homes of many who read this report shall prove as great a convenience and as satisfactory as has mine, I shall be amply repaid for the little time spent in writing this. It is not my purpose to set forth any reasons why the farmer should have running water in his residence. No argument is needed. To all who are enjoying the use of any such system, however simple, the desirability stands as a self-evident truth.

When I began figuring on putting water in my residence, which is a large one built with heavy timbers after the style of many years ago. I soon saw that I should have to overcome difficulties not to be found in installing a system while the house is being built, or even in putting in water in a more modern house. But I was not discouraged. I wrote for a number of catalogues and read one or two books on plumbing, but I soon found that, after all, most that was needed was care, thought and a reasonable amount of mechanical skill. So I went to work. The result was that without ever having had a professional plumber in the house, I installed a water system—with bath tub, toilet and wash basin in the bath room; sink in the kitchen, and wash-basins with hot and cold water in bed rooms—that, after more than a year's use, has given general satisfaction. I may say just here that when the water was first turned on there was not a leak anywhere. Mine is the pressure tank system, the water being pumped into the tank, which is 8 feet long and 42 inches in diameter. It is easier to pump water than air. Then, it is much easier to get a pump that will work satisfactorily with water. My tank is made to withstand a pressure of 150 pounds to the inch, but a 40 pound pressure will be found sufficient for all needs, sending the water with force to all parts of the house. The tank is in a south basement where there is little danger of freezing. It is always fortunate, as in the case in my house, if the kitchen is also in the south part, so that the tank and heater may be close together. It is a mistake to buy a tank that is too small. I would recommend one holding 750 gallons or more. I much prefer the pressure system with tank in cellar, rather than the elevated system, which is subject to change in temperature. With the tank in the cellar, the water is cooler in summer and warmer in winter. It is not exposed to the sun, so there is no green scum (Protococcus Viridus) to bother.

My experience has convinced me that, under ordinary circumstances, the average farmer with some mechanical skill may do his own plumbing, if not too complicated. Two pipe wrenches and a few small tools are all that are required.

I used about 300 feet of piping in my house. One-inch galvanized piping costs, ordinarily, 6½ cents per foot. Never put in less than one-inch main pipe, and 1¼ inch is better. A 750 gallon pressure tank should cost about $80 wholesale, or, at retail about $100, delivered. A hand pump, such as I used until I bought a little gasoline engine, costs $6 or $7. A gasoline engine, if bought new, with pump will cost from $50 to $60. One man by pumping fifteen minutes per day can keep up enough water for a family of six people. With a small gasoline engine, a few minutes pumping twice a week will run the same family. The final cost of a complete water system will depend entirely upon the individual taste and pocketbook—say $200 for plain fixtures up to $600 or more for something more pretentious. Just here let me say that it will pay to buy good heavy bowl, basins and fixtures of all kinds. They need not be showy, but they should be substantial.

All pipes should be put in with red lead, and all fittings screwed tight. Have no flat pipes. Have them laid elevated, or slanting, so that when you want to drain them all water can be made to flow back to tank or drain system. This is important. There should be one main pipe (1 or 1¼ inches in diameter), leading from pressure tank almost to cooking stove or range, where it branches. One branch conveys the water through the heater, then to the hot water tank, and from it to all parts of the house, paralleling the cold water pipe throughout its entire length. By saying parallel, I mean that the pipes should be placed within a few inches of each other—say 5 or 6 inches, but not so near that the hot water will heat the cold, or vice versa. When it is necessary to run the pipes very close together a board partition may be used.

In laying out plans for your system make no more turns in pipe than are necessary. Where branches are made for wash basins and the like, smaller pipes may be used than for the main pipe. Pipes may also decrease in size as the distance from the pressure tank increases.

The kitchen sink should be as close to the main out-door sewer as possible. All slush water should pass out in order to keep this pipe clean, as grease causes most of the trouble.

Where water pipes pass from the ground up into the house a box should be made around them and extending at least two inches from all pipe. This box should be filled with melted resin. A box at least two feet square should then be made around it. Fill this box with stable manure, one of the best known materials to keep water pipes from freezing. Remember, after a year or two, to look into the top of the manure box to see that it is full, as the manure may have settled. If so, fill to top and pack tight. Do not use asbestos or mineral wool. Mineral wool is one of the best cold conductors there is, as used in cold storage, but is of no value in causing a body to retain heat. It is just as important to pack the hot water pipe as the cold, as the hot water pipe will always freeze first, as the mineral life is dead in it, caused by intense heating.

Where pipes are run along under or just above floors in rooms where fire is not continually kept up a good idea is to box them in with sawdust. In running pipes along floors, as just referred to, they should be elevated a little so that they will always drain back to the pressure tank. By having a drain pipe from the low point in the pipe line and leading to the sewer, the entire system may be drained by turning the stop in the drain, and turning stop cock off in pressure tank so you need not drain the pressure tank. This may, when extreme cold snaps come, prevent the annoyance and expense of bursted pipes.

Soil pipe should be used in and under the house exclusively. Do not depend on drain tile, for fear of leaks. I would advise that drain tile be used outside of building. If it is used under the house it is liable to crack and cause a seep which might result in a typhoid fever epidemic. The soil pipe should be calked tight with lead and all joints should fit perfectly tight. All discharge from washbasins, sinks, stools, etc., should be made into this pipe. The main soil pipe should be four inches in diameter. Wash basin pipes need not be larger than two inches. Be careful that connections are made tight into the main sewer pipe. The drain pipe should always enter the main sewer pipe on top, so as not to interfere with the passage of soil. The soil pipe in and under the house should have a fall of at least one inch to the foot and more is preferable. Where it enters the outside of the building one-half inch to the foot is all that is necessary. A large drain tile—say six inches—is never an objection, and may save a great deal of work afterwards. If any drain pipes pass well or cistern, you should use iron soil pipe well calked, as any seepage from drain pipe might cause typhoid. Soil pipe fittings should always be used where one pipe enters another. Where soil pipe enters tile at foundation of house a soil pipe trap should be put in to prevent gases from sewer pipe from passing into house. A good idea is to run a piece of soil pipe, with a plug in it, up above the ground so that you may at any time pour water into it and flush it out. Where the closet is attached to soil pipe a branch should be put in and run out through top of house in order to allow the gas to pass out, also to keep down noise from closet as this stops the suction noise that sounds through the house. A cover, similar to those used on ordinary flues, should be put on this pipe to keep out sparrows and any sticks that might fall in, and to allow free passage of air. It is always a good idea, in installing a water system, to leave a few plugs (or T's) vacant so that in case you later desire to put in other fixtures you can tap in and also have drain to sewer. This is not necessary, but is only a suggestion.

Always leave one or more plugs in main pipe from pressure tank so that they may be tapped at any time you should wish to put in hydrant or run water to any other part of place.

Galvanized iron pipe is easily installed and is nearly as good as any. Lead pipe, which is often acted upon by certain substances found in water, has one advantage insomuch that it will freeze and thaw a few times without bursting, but it takes a good plumber, to handle lead pipe, as every joint should be wiped, and you can never repair it without the plumber, so would advise using galvanized.

Have all down gutter spouts so arranged that you may, when you so desire, turn them into the sewer, thus keeping it clean by frequent flushing.

Always put your pump as close as possible to the end of the pressure tank, and the other end of pressure tank against cellar wall so pipe can pass out of pressure tank into wall and prevent freezing. This will save pipe and prevent freezing. Keep all pipes away from outer walls. They should run near the center of the building for protection from cold.

Put stop cocks in all pipes a few inches from where they enter wash basins or tanks. One of these cocks will prove a great convenience when it becomes necessary to put in a new Fuller ball or otherwise repair faucet, for it makes it possible to cut off the water at the one point without turning it off the entire house. Use none but the new style faucets which have one extra joint, making the putting in of a new valve a very simple matter. Use traps under bowls and bath tubs. Also see to it that traps under bowls and leading from tub are so constructed as to be easily cleaned.

Think your system over carefully and cut out any excess piping that you can, and make the piping run as direct as possible to the desired places.

Use a large hot water tank, as plenty of hot water is a great convenience and the water retains its heat much longer when in large quantities.

The most simple, the most easily regulated and the best fixtures are important for the man who is several miles from a professional plumber, and who must, in most instances, do his own work.

DISPOSAL OF HOUSE SEWAGE.

(By Prof. John T. Stewart, University Farm, St. Paul, Minn.)

(Reprinted from Minnesota Farmers Institute Annual, 1909.)

The equipment of the modern house with bath room, kitchen sink and laundry has created a demand for some sanitary method of disposing of house sewage. This demand is supplied in the larger towns and cities by sewers which collect and carry the sewage to a common point of disposal. In the smaller towns and rural districts the above method is not practical from a financial standpoint, and some simple and economical plan must be resorted to. A common practice is to drain this house sewage into a vault or cesspool, the surplus water being permitted to soak into the soil. In open soils the water often escapes so rapidly that the vault is soon filled with solid refuse. In the more heavy soils, the pores are soon closed by the solid matter and the waste flows out over the surface. It is only occasionally that the soil conditions are right to permit the water to escape at the proper rate, and even where these cesspools do work satisfactorily for a time they will eventually fill up with solid matter or the escape of the liquid be prevented entirely by the sealing of the porous soils by the material carried in suspension. At the best, they saturate the surrounding earth with disease germs that are liable to contaminate the water supply or become offensive to the sense of sight and smell.

DESIRABLE BACTERIA IN SEWAGE.

It has been learned that under proper conditions this house refuse that is so dangerous to health and offensive to the senses carries with it the germs of a bacteria which will work its own destruction if the proper conditions are provided. Occasionally a cesspool is reported which has worked for years with entire satisfaction. The reason for the satisfactory working of these occasional cesspools is due to the fact that in their construction the conditions of light, air, heat, currents and discharge of the liquid matter were such that they afforded the proper conditions for the growth and multiplication of these sewage destroying bacteria. The conditions under which these bacteria thrive have been studied and experiments conducted until the proper condition for their growth is understood, and they are now considered of great use for the purification of sewage not only of individual houses but for the larger towns and small cities.

CONDITIONS UNDER WHICH THESE BACTERIA THRIVE.

It has been found that these bacteria thrive best where there is a limited amount of light and air, a certain degree of heat and a surface unbroken by currents. These conditions are secured by discharging the sewage into a tank from which the light is excluded by a covering, air being admitted through a small vent. Heat is supplied by the hot water used in the sinks and lavatories, and that generated in the tank itself by chemical action in the sewage. This heat is conserved by having the tank partially or entirely buried in the earth. Currents are prevented in the surface of the sewage by partitions through the tank, the sewage passing from one chamber to another through submerged openings. The solid matter is thus decomposed into liquids and gases, the gases passing off into the air, and the liquid which is now free from dangerous germs being discharged either through a sand filter out on to the soil or carried away by ordinary underdrains to an outlet ditch. This waste material is thus deprived of its dangerous and unsanitary qualities by a method that is simple and requires but little attention after it has once been installed. Such systems, varying in their detail to meet local conditions are now in use in many places throughout the country and their operation is no longer an experiment.

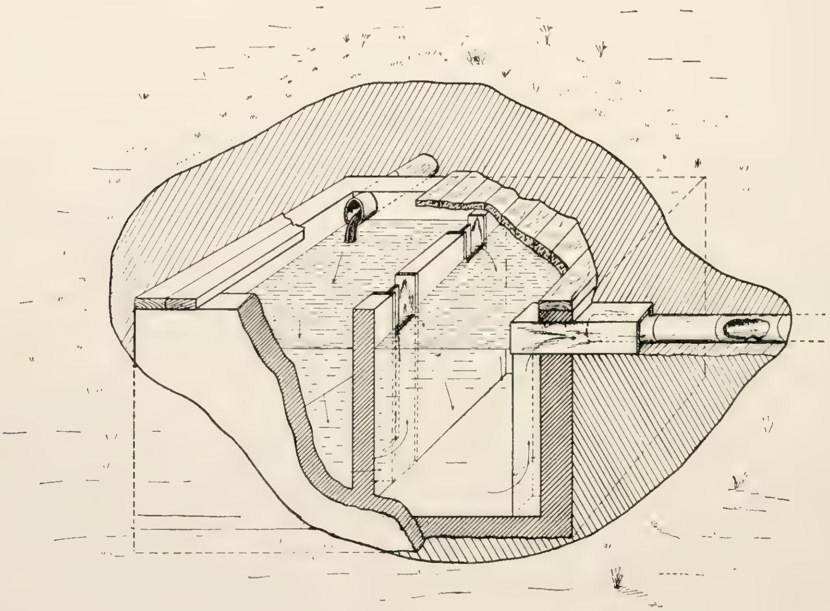


Fig. 1. A general view of a septic tank.

SEPTIC TANK FOR ORDINARY HOUSE.

A plant of this nature is known as a septic tank. One suitable for a private house of four to six people would be a tank constructed of some material, preferably concrete, which would prevent the seepage of the sewage into the earth until it has passed through the tank. This tank can be placed at any convenient point with reference to the house. Some methods of construction permit of its being placed within three or four feet of the walls, the sewage being discharged direct from the iron soil pipe into the tank. The tank should be not less than six feet in length, three feet deep and three feet wide, divided into two chambers by a partition, the first chamber being large enough to hold the discharge from the house for 24 to 36 hours.

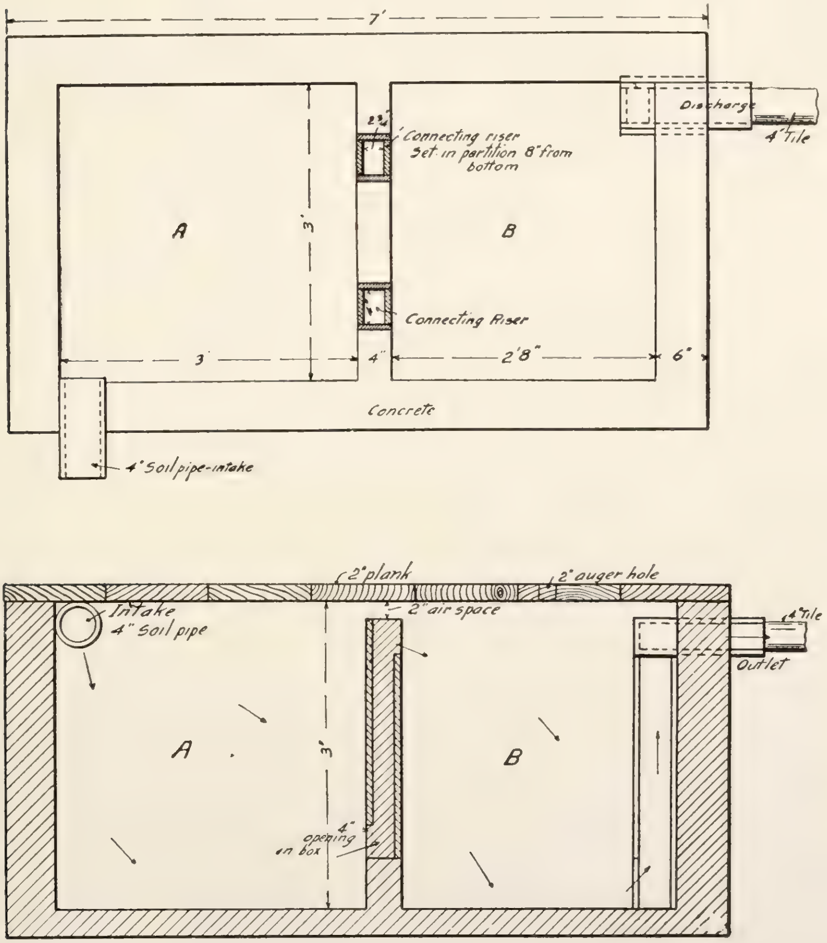

7'
Discharge
4" Tile
2¼"
Connecting riser Set in partition 8" from bottom
A
3'
B
Connecting Riser
3'
4"
2'8"
6"
Concrete
4" Soil pipe-intake
2" plank
2" auger hole
2" air space
Intake 4" Soil pipe
4" Tile
Outlet
A
3'
B
4" opening in box

Fig. 2. Plan and vertical section through septic tank connecting with underdrainage system.

PLANS OF A SEPTIC TANK.

The following plans show the different methods of constructing septic tanks suitable for the country house.

The sewage from the soil pipe enters chamber A, passes diagonally through chamber A to near the bottom of the tank where it enters the opening in the partition and rises through this partition to near the surface of the liquid, where it is discharged into chamber B. It then passes diagonally through chamber B to near the bottom of the tank where it enters an opening in the end of the tank and rises in this end to the level of the liquid surface in the tank where it is discharged.

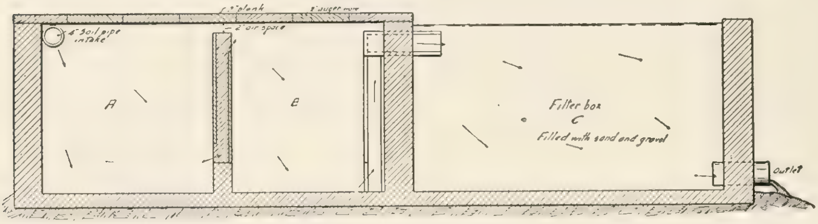

2" plank
2" auger hole
4" Soil pipe intake
2" air space
A
B
Filter box
C
Filled with sand and gravel
Outlet

Fig. 3. Septic tank with sand filter discharging on surface of ground.

SAND FILTER.

If an underdrain is not practical for removing the waste water from the tank, it will be necessary to let chamber B discharge through a sand filter, as shown in Fig. 3, or replace the opening in the discharge end of chamber B by an automatic valve Fig. 4, and conduct the discharge to the system of drain tiles Fig. 5.

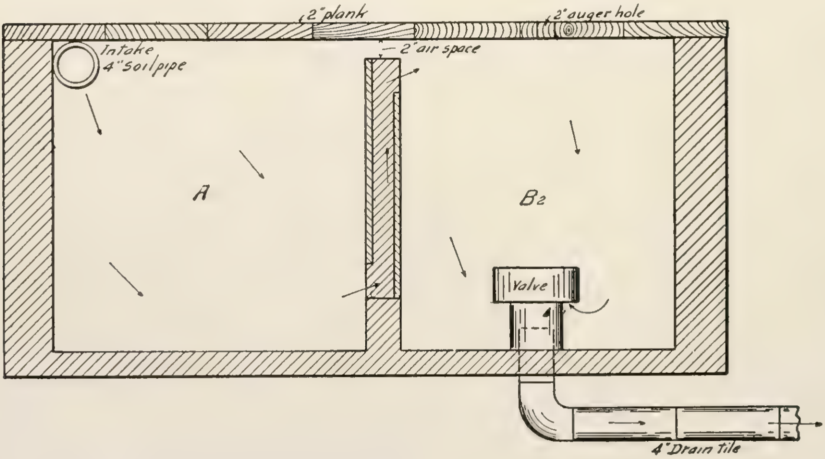

2" plank
2" auger hole
Intake
4" Soilpipe
2" air space
A
B2
Valve
4" Drain tile

Fig. 4. Septic tank fitted with automatic valve.

DISCHARGE IN DRAIN TILE.

Where the liquids from the tank can be discharged into an underdrainage system, Fig. 2, the tank can be constructed entirely underground and sodded over. Where there is not an outlet for an underdrainage system and it is necessary to discharge the liquid matter on the surface, it may be done either by constructing a sand filter in connection with the tank as shown in Fig. 3, or discharging into a system of drain tile and permitting it to escape by percolation through the soil as in Figs. 4 and 5.

Where a sand filter is used and the discharge is on the ground surface, it is necessary to construct the tank above ground unless its location is on a side hill, and it would necessarily have to be at some distance from the buildings, as the filter should be exposed to the air and the surrounding soil would be kept wet by seepage unless there is underdrainage or running water.

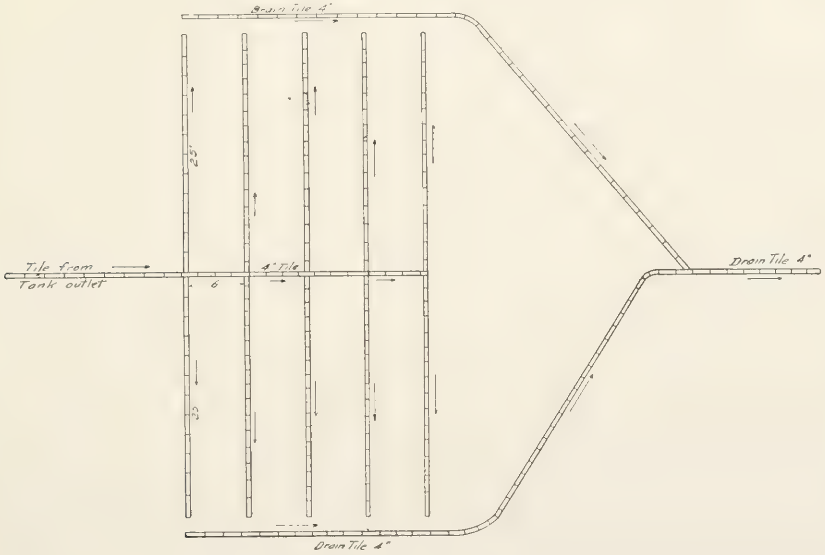


Fig. 5. System of drain tile used in connection with automatic valve.

A tank arranged to discharge into a tile system, Fig 5, is more generally used for the individual houses than the sand filter. This method requires chamber B to be fitted with an automatic valve as shown at B, Fig. 4. This valve permits chamber B to fill with sewage, which would require from 24 to 36 hours. When the chamber is full the valve opens and the liquid flows out through a line of pipe to the tile system, Fig. 5, where it is absorbed by the soil. This tile system is made of ordinary drain tile with open joints. As the absorptive power of the soil and the circulation of air through the soil decreases as the depth increases, the tile should be laid not over ten or twelve inches in depth, unless the soil is very porous. This tile system for proper distribution of the liquid should be laid level, and the capacity of the tile for holding liquid should be about ten per cent. larger than the capacity of the valve chamber. The pipe connecting the valve chamber with the tile system should have cemented joints to prevent leakage between the tank and the tile system. If conditions will permit, it is desirable in heavy soils to lay two lines of drain tile about thirty inches in depth as shown in Fig. 5. These drain tiles, not absolutely necessary, if they have a proper outlet would obviate the danger of the filter not working during the rainy period, when the soil is saturated with water. It is advisable in a cold climate to cover the filter with manure or a heavy mulch. Where the building location is flat it would be necessary to construct the tank above the general level of the surface as it would discharge from the bottom.

SEPTIC TANK AT N. W. EXPERIMENT FARM.

A tank as shown in Fig. 2 was constructed at the Northwest Experiment Farm at Crookston, Minn. The discharge is through a tile drain with outlet in an open ditch three hundred feet from the house. The tank is placed within three feet of the house foundation. It has been working for two years and is entirely satisfactory. Its original cost was $18.65. The tile drain had previously been constructed for general drainage purposes. Details of cost items and the method of constructing this tank are given on pages 79 to 81, of bulletin No. 110, of the Minnesota Experiment Station. A tank with a sand filter would require in addition to the tank as shown in Fig. 2, an additional tank double the size of the last chamber, to serve as a receptacle for the sand and gravel filter.

A tile filter system, Fig. 4, requires the construction in addition to the tank, of the tile filter system and the automatic valve, the valve alone costing from $20 to 25.

One of these plans will be found suitable for almost any location and there is now no reason why isolated houses cannot be fitted with modern plumbing and the house sewage disposed of in a sanitary manner.

MISSOURI HOME MAKERS' CONFERENCE.

Proceedings of Third Annual Meeting Held Under Auspices State Board of Agriculture in the Agricultural College, Columbia, December 28, 29, 30 and 31, 1909.

MINUTES OF PROCEEDINGS.

The Missouri Home Makers' Conference held its third annual session at the University of Missouri, during the last week in December. On account of the severe weather, the attendance was not as large as in previous years, but the interest was undiminished. Enthusiastic audiences, varying from 35 to 300 persons, greeted each speaker. All papers were thoroughly discussed. This interchange of ideas was one of the most interesting and valuable features of the meeting.

The program for the Conference had to do with the various aspects of the home makers' life and interests. The subjects discussed may be grouped under five general heads, namely: "The Home," "The Child," "Food," "Health" and "Education." It was felt that the influence of the home maker must touch in a vital way all these interests, whether directly her daily work or not, since the every day home work is not a thing apart from the general life of the community, but each reacts to the good or evil of the other. It was decided that the conference should join with any and all organizations which have for their object the improvement of conditions in the homes of the State. Mrs. Harriett E. Shepard, president of the State Federation of Women's Clubs, sent greetings to the Conference, commending the work in which it is engaged. "There is," said Mrs. Shepard, "no work in which the women of our State should be more vitally interested than that which brings together our representative home keepers; and there is no subject of study so far reaching in its influence for direct results as that which has to do with the daily comfort and convenience of those who occupy the home; for the material needs of mankind are imperative, and everything that helps to create a convenient, wholesome, refined and satisfying basis for the physical life, lifts the human race to a higher plane, so that it may go from strength to strength, enlarging its interests and reaching out into the realm of thought and spirit, growing strong and beautiful with the unfolding of life's responsibilities.

"The State Federation of Women's Clubs is especially interested in this Conference, as it articulates so closely with one of our most important standing committees—that of Home Economics. We are most anxious that the women of the Conference should ally themselves with this part of the State work, and that they should see to it that definite instruction in scientific home-making be included in the plan of the Farmers' Institutes, which are now becoming a settled feature of educational work in various parts of the State.

"At the last Board meeting of the Federation, it was voted that the Committee on Home Economics should make the matter of clean and pure foods one of its first considerations for the coming year, and we ask you to help us in this movement toward more healthful conditions for the consumer in the home."

On Tuesday afternoon tea was served informally by the students in the rooms of the Home Economics Department. In addition to the equipment, visitors were shown an exhibit of the work of the cake-mixer, and of the weighed portions of food, illustrating Miss Day's talk on "Planning Meals."

On Wednesday afternoon the members of the Conference were entertained most delightfully by Mrs. A. Ross Hill, at her home, where they met the wives of the members of the faculty of the University.

Another very enjoyable social occasion was the fifth annual Agricultural college banquet, which was served on Friday evening

The following officers were elected:

President—Mrs. N. H. Gentry, Sedalia.

Vice-President—Dr. Edna D. Day, Columbia.

Treasurer—Miss Alice Kinney, New Franklin.

Secretary—Mrs. Ivy Harner Selvidge, Columbia.

Mrs. W. C. Hutchison, Jamesport, was elected a member of the Executive Board.

IVY HARNER SELVIDGE, Secretary.

CONSTITUTION.

Article 1. Name and object.—This organization shall be known as "The Missouri Home Makers' Conference."

The object of this organization shall be to unify the house-keepers of Missouri in an effort to better their own home conditions, to help future homes by encouraging the introduction and development of Home Economics in all the schools of the State and to co-operate with other organizations working toward the same end.

Article 2. Membership.—Any woman in Missouri interested in the objects of this organization is eligible to membership.

Article 3. Officers.—The general management of the organization shall be in the hands of an executive board consisting of a president, vice-president, secretary and treasurer, elected annually, and of three other members, holding office for three years, one of whom shall be elected each year.

Article 4. Meetings.—The meetings shall be held in Columbia, annually during Farmers' Week.

Article 5. Amendments.—This constitution may be amended at any annual meeting by a two-thirds vote, the proposed amendment having been submitted, in writing, to the executive board, and notices and copies of the same being appended to the call of the meeting; or, without such notice, by unanimous vote.

BY-LAWS.

ARTICLE I.

Section 1. Duties of Officers.—The duties of the officers shall be the same as in similar organizations.

Sec. 2. The duties of the Executive Committee shall be to appoint such standing committees as in its judgment it deems wise; to transact routine business between annual meetings and make a full report of its work at the annual meeting.

ARTICLE II.

Section 1. Elections.—All nominations and elections shall be by ballot.

Sec. 2. In case of vacancy in any elective office, the president may fill the same by appointment until the next annual meeting.

ARTICLE III.

Section 1. Dues.—The dues shall be fifty cents annually.

ARTICLE IV.

Section 1. By-laws may be adopted, amended, or suspended at any annual meeting by a two-thirds vote.

WHY WE ARE HERE.

(The first meeting of the Conference was in joint session with the various farmers' organizations. In response to addresses of welcome by Dean Mumford and Professor Whitten, Miss Edna D. Day, as vice-president of the Home-makers' Association, spoke as follows):

The sociologists tell us that women were the first farmers, so it is not surprising that women are with you today. Early man hunted and fished, and fought, and made the weapons necessary for his warfare, and the women did all the rest of the work. They had, of course, to take care of the fires, which could not be allowed to go out because there were no matches; cook the food and take care of the babies. In addition, they had to make jars in which to carry water, and baskets in which to gather fruits and nuts; make from the skins of animals their clothing; carry home on their backs the animals that the men killed in the chase, and seek for and crudely cultivate such vegetable foods as were eaten. Thus were women the first farmers.

By co-operation and invention men learned how to do their work more easily. They learned to combine in the hunt. They learned that it was cheaper to raise and care for cattle than to hunt them. They learned, by arbitration and treaty, to avoid war, and so it came about that soon man had time to take over the agriculture that the women had begun. The records of the early farmers' meetings have been lost. I doubt, however, if any women had time to attend them, for they still had the fires to keep, the blankets to weave, the game to dress, the water to carry, and numerous other things to do. Still later, the men, by co-operation and invention, succeeded in so conducting their work of agriculture that there was time left for them to take over some more of woman's work. They saw that the women were slow in getting home the fruits of the chase, slow in moving when the tribe had to move, so they undertook to carry some of the burdens. However, when the men took the burdens upon their backs they felt how heavy they were. The women had carried them without complaining, but the men, feeling their weight, looked around for relief, and saw that the beasts had horizontal backs, broad enough to carry burdens, and they put the burdens upon the beasts. They again walked freely themselves, and when the beasts' backs would not carry all the burdens, the men invented wagons. They invented boats, and comparatively recently, freight trains to carry their loads. Men are equal to anything. If you put a man into the kitchen for a week, how long will it be before he will have running water there, and all the other conveniences that the women get along without?

So, through the ages, men have gradually been taking over the work of primitive woman, and simplifying it, and the women have been doing better and better the work that remained for them to do. Still they have seemed to be always busy. They have been very slow to cooperate, very slow to invent, to find easier ways of doing work. I do not know that it is due to a difference in the minds of men and women that men have been so inventive, and women have not. It may be, but I think there are other factors to be considered. Women have had to work in isolation in their own homes, and you know it is only when minds come together that the sparks fly. I have heard that agricultural science has been slower of development than other sciences because the farmers are isolated, and that agricultural science has progressed rapidly only when farmers' institutes became common and ''Farmers' Weeks'' were frequent. The women have been slow to get together. Now we are offering an opportunity in our Home Makers' Conference for them to gain inspiration for advancement.

Another reason why women have been slow to progress is because of the continuity of their work. ''Man works from sun to sun, but woman's work is never done.'' In the early days of hunting and fighting there were periods of idleness for the men. They worked very hard at times but there were days and weeks when they could live on the results of their last chase or the booty of the last war, and loaf around the fire while they recalled their experiences and planned their coming campaigns. The farmer today has less free evening time than the average business man, but he has days of comparative leisure during the winter when he goes over his accounts, reads agricultural bulletins and consults agricultural catalogues.

Woman's work on the contrary has been constant. Daily, hourly, her services have been needed by her family. She has found no time to stop and think and read and plan easier, better ways of doing. In the past she has been bound by these necessities. Today, with much of the old work taken from the home, with labor-saving devices ready to go into the home, there is no reason why work should not be planned to yield the leisure needed for recreation and inspiration. If your wife hasn't succeeded in doing this for herself, suppose you help her to do it. Buy her labor-saving machines as freely as you buy them for yourself. Show her how to use them if she is slow to learn herself, and help her to plan time for stimulating reading and outings.

I see many more men here than women. I must conclude that many of you have come away and left your wives at home. I hope you will realize that you have made a great mistake. I hope that each one of you will step into some of our meetings during the week and learn something about what we are doing, so that when you go home you can tell your wife about them first hand, and encourage her to come next year; and when you get the report of the State Board of Agriculture this year, will you please call your wife's attention to the report of our meetings? I am sure she will find in it something of interest.

Some time when the department has better facilities and equipment, and a better teaching force, we hope to do what the Agricultural College is doing for the men—to have a short course for the women in Home Economics. There are many women in the state who cannot leave home for the full four years' course just as there are many men who cannot do so. If you know of any women who might take advantage of such a course, who might learn by study how to work to better advantage, perhaps you will see to it that we have these facilities. It is true that our regular course has suffered because of the short University appropriations this year, and it has been necessary to limit the number of students we could take in the freshman work, in order to do justice to the graduating class. Before the registration days were half over we were obliged to tell students applying for this work that the rolls were full. Of course this is only a temporary condition. I am sure that we shall soon have sufficient funds not only for our regular work but for a short course as well. In the meantime, we can have the Home Makers' Conference here during Farmers' Week, and we are very glad indeed to have the opportunity to be with you during this time when we are to have a feast of so many good things.

PLANNING AND FURNISHING THE FARM HOME.

(Mrs. Ivy Harner Selvidge, Columbia, Mo.)

Health, convenience and beauty are the three prime requisites of a well planned, modern house. To secure them requires thought and understanding upon the part of owner, the architect and the contractor. Of these three, health ranks first and certain conditions are absolutely necessary for a healthful dwelling. First there must be a light, cheerful and dry site; second, means of ventilating to carry off respiration impurities; third, a system of immediate and complete removal of sewage to keep the air free from contamination; fourth, pure supply and proper removal of water to insure cleanliness; fifth, such a construction of the house as will insure perfect dryness from foundation to roof.

Fortunately the farmer has considerable land from which to make a selection for a location for his house. Usually it is possible to find a well drained site; if not it must be drained artificially, for dryness is imperative. In climates such as this we depend upon the opening and shutting of doors and windows for ventilating small dwelling houses, and if the house is carefully planned will ventilate it successfully in ordinary weather. The consideration of the water supply and the sewage system is more of a problem to the isolated houses than to the town houses since the system of each must be complete and individual on the farm. As the question of running water for the farm house is to be fully discussed before this conference I pass it over. There is this to be remembered, however, that the disposition of sewage is a matter of grave importance and the problem of its removal and disposal should be placed in the hands of trained men. Too much emphasis cannot be placed upon this need.

The planning of a house intelligently, requires the co-operation of the persons who are to live and work in it with a trained architect. No plan is good except as it meets the needs of the user. We must ask ourselves several questions: How many persons and what ages are to occupy it; what work is to be done in it, and what are the habits of the family? While the average family includes several small children, not one house in five hundred takes them into account except in the matter of providing a place for them to sleep. A fatal mistake is to copy a neighbor's house. It may suit his needs exactly and ours not at all. If you are planning to build a house, study your needs, decide on some of the important features. Do not expect an architect, if he is a man, to plan a convenient kitchen for you to work in. He never did kitchen work while you have done it for years. If you work out the details of your own plans irrespective of the architect the chances are you will have a clumsy, ugly construction, for you are not familiar with the work of an architect. Go to him with a fairly intelligent conception of what you want, and the result of the work of you both is apt to be satisfactory.

Beauty and convenience are not incompatible, and neither is necessarily a matter of cost. Beautiful and convenient houses may cost little while ugly houses may cost much, and lack the element of convenience.

As the kitchen is the chief work room in the farm home we will consider some of the important features necessary to a convenient kitchen. It is a mistake to believe that you may always make a kitchen convenient, after the house is built. The location of the range and sink and the distance between them should all be settled before the house is built. Unless some thought is given to it they will very likely be in opposite corners of the room. Locate them as close together as possible to save unnecessary steps. Then group the other kitchen equipment in the most convenient places in relation to sink and range. Remember that a convenient kitchen is a matter of thought, not money. Have plenty of cupboards, as many closets as you need, and your pantry in the best location. A small sliding window between kitchen and dining room saves steps. A cold storage room just off the kitchen where the refrigerator may be iced from the kitchen porch saves work in cleaning.

The finish of the wood work of a house may make work or save work. The best floors for moderate price are red oak. It also is a beautiful wood for the upright finish. If possible have the down stairs, except the kitchen, done in oak. In a room 16x16 feet the difference in cost between a hard pine floor and finish and a red oak floor and finish is not to exceed $10 more for the oak. Oak floors should be filled and waxed and they should be kept in practically the natural color, which is light. This prevents the dust from showing as it would were it stained dark. It pays to see that the boards in the floors are free from knots and well scraped and sand-papered before the finish is applied. The upright finish may be finished natural—*i. e.*, filled and varnished, or stained. The finish most popular now is a stain with a lusterless varnish, giving a dull finish. Since waxed floors cannot have water applied to them, many prefer the floors of the bedrooms—if they are pine—to be filled and then coated with "elastica"—a finish which is not affected by being wiped with a damp cloth. Any floor finish will require renewing. A waxed hardwood floor grows more beautiful with each waxing, and the wax is easily applied by any one.

The best furnished house is that which has in it useful pieces of furniture, of a character which indicates beauty in design and strength and permanence in construction. We are getting away from the spindle legged chair, and similar constructions in furniture, where the articles possess neither beauty nor utility. A room is well furnished when it has in it just what you need for the work of that room.

RUNNING WATER IN THE COUNTRY HOME.

(Professor M. F. Miller, College of Agriculture.)

I am sure that no great part of this paper should be given to a discussion of the desirability of having a supply of running water in the country home because our country women as a rule recognize the great importance of this matter. If I were addressing an audience made up of farmers, I think I should dwell strongly upon this phase of the question, for if there is any one thing in which we as farmers are deficient, it is in the full appreciation of the importance of making our farm houses more comfortable and convenient. I place myself in this class because it has only been in recent years that I have come to anything like a true appreciation of the great necessity for making the work of country women lighter. I have seen my own mother practically wear her life away at tasks which a little thought would have made infinitely less burdensome. It seemed to be only a matter of course. Other country women did the same things, and it did not enter the minds of the men about the house that anything should or could be done to make this labor lighter.

My father was the typical busy farmer with too many cares of his own to give much thought to matters about the house while the boys had their own share of work in the fields. The result was that the women folks ran the house as best they could and my mother with the patience and self sacrifice so characteristic of country women worked from morning till night at tasks often too heavy for her strength.

Pardon this personal introduction. I give it merely to show that I am not unfamiliar with the conditions that exist in the average farm home and to place myself in that class of thoughtless farmers who through a mere matter of custom in most instances, coupled with the negligence born partially of short sighted economy, allow conditions to exist around the country home which are not only unnecessary but which are really very poor business policy.

I, however, do not care to censure the farmer without at least saying a word in his justification in this matter. We must remember that most of us are what we are, largely because of certain long continued lines of training. We have certain points of view because we have been reared under such and such an environment. We think as others think. We do as other folks do. The different activities of which our lives are made up take the form of habits. In the case of the farmer, therefore, he has been raised under conditions which have never led him to think but that the average condition in the home is perfectly right and it is only the exceptional man, the man of uncommon originality, of wider experience, or of great education who will do differently unless his wife requires it. And too often our country women, either through self sacrifice or frequently through failure to see the importance of greater comforts and conveniences themselves, fail to bring about needed changes.

In my opinion one of the very first essentials to comfort and convenience in the farm home, next to a proper plan (which by the way is far too often left to the country carpenter) is the presence of running water. The carrying of water from well or cistern, sometimes remotely located from the kitchen door and too often provided with a pump that "runs down" between trips, or even with a rope and bucket, is too well known to need attention. If some farmers would stop to calculate the number of miles their wives or daughters walk during a year carrying water, often through rain or over ice covered walks, he would secure a result which would go a long way toward awakening him from the lethargy in which he lives.

One of the most important considerations in supplying water for the farm home is the character of the water supply. The cistern may be perfectly satisfactory if precautions are taken to prevent surface water entering, and a solid cement wall should always be provided to insure pure water. The ordinary dug well may also be satisfactory, but such a well is always questionable. Typhoid and other bacteria may gain entrance through the surface water and instances are all too numerous where this has occurred and the water still have every appearance of wholesomeness. This can usually be prevented by tightly cementing the top ten feet with cement during a dry time, but even with this protection a driven well is always to be preferred.

Where water is secured from a spring or stream there is always a possibility of contamination, although in the case of a good spring the danger is small. Many instances are on record, however, where springs have been the cause of severe typhoid epidemics, and the common idea that spring water is always pure is erroneous. Too great care cannot be taken in obtaining pure water, therefore, and there is no surer way than to provide a good driven well in which the supply comes from depths of forty feet or over. Because for years we may have used water from some particular dug well without a case of typhoid is no assurance that it will never come. A visitor at the home, who has only recently recovered from this disease, may furnish a pollution for a dug well that has always been perfectly pure. The result may be a loss for which no amount of money or subsequent care can ever atone. Country people are far too careless about the character of the water supply.

Naturally the first thing that appeals to the average farmer when he once comes to consider the matter of installing water in the house is that of expense. And this is justifiable; for in spite of all the editorials in which our optimistic newspaper and magazine editors indulge, the average farmer must usually be mindful of this phase of the question. But it does not necessarily mean an expensive plant to give a great many of the conveniences offered, and in this connection I wish to call attention to probably the simplest plan of bringing water to the kitchen.

This plan consists simply of the installation of a sink at a convenient place near the kitchen table, if possible, on which is mounted a common pitcher pump connected with the well and cistern by iron pipes. Where both hard and soft water are desired, two pumps can be installed, one connecting with the well, the other with the cistern. In this case two sinks are usually installed, although it is perfectly feasible to use a single sink and pump with a cut-off which can be turned instantly to connect with well or cistern as desired. The waste pipe from the sink should be of lead, an inch and a half inside, and should connect with a three or four-inch tile running to the nearest outlet. It is desirable for sanitary purposes to place the ordinary small trap beneath the sink and to use glazed sewer pipe with cemented joints for the first fifty or one hundred feet to avoid any possible contamination of the well. White porcelain sinks are available at every plumber's shop, or they may be ordered of various companies handling plumbing goods. They are very much to be preferred to other kinds. If the edges are rounded in a wide roll this adds much to their appearance and aids in keeping them clean. Such a plan can be worked out with perfect satisfaction on most farms at an expense approximating $40.00. The supply pipe used should be the 1¼ inch size, and, if the distance from well or cistern to the sink is over thirty feet, a force pump should be used instead of the pitcher pump. A pitcher pump is worth $6.75, a 20x30 inch white enamel sink $6.00, a force pump $12, the small lead trap beneath sink $1.75, lead piping is worth 45c per foot, and the 1¼ inch iron piping 15c per foot cut ready for installing.

The more convenient method of supplying water in the farm house, is the common plan of a supply tank from which the water is conducted by pipes to faucets located wherever desired. This plan usually necessitates considerably greater expense but it offers many more conveniences, among them the installation of a bath tub and closet. Supply tanks for this purpose are of two general types, the elevated tank and the pressure tank. In the elevated tank the water is raised either by hand or by a convenient power such as a wind mill, a gas engine, a hot air engine, or in some very fortunate locations by a hydraulic ram. It is not necessary to enter into a discussion of these sources of power here, except to say, that the hand pump is usually the cheaper and the windmill the most common. Gas or hot air engines require considerable attention and the hydraulic ram is possible only in locations where there is a stream with a considerable flow of water which has a fall of several feet.

Elevated tanks may either be located in the attic of the house, or on a tower several feet above the faucet outlets. The attic tank is usually the cheaper and is in less danger from frost. It also offers opportunity for cheaper plans of installing pipes than in the case of the tower tank.

A simple form of installation is an attic tank into which water is pumped by hand. Such a plan answers very well for the kitchen supply of either hard or soft water and ten to twenty minutes pumping each day will maintain a supply sufficient for the ordinary family where a suitable force pump is installed. This pump may be installed at the well or cistern, or in the kitchen, and a cut-off can be so arranged that water may be pumped either into the tank or for immediate use as desired. Such a plan would not give sufficient water to supply a bath room with closet, without the pumping becoming rather irksome, but it answers very well for a kitchen supply, also for a bath tub supply. A precaution to be observed is to be sure that the strength of the construction of the house is sufficient to carry the weight of the tank when filled. It may be necessary to put in extra timbers.

The cost of such a plant where the well or cistern is located within thirty feet of the house would vary from $150 to $175. These figures allow two sinks, one in the kitchen and one in the basement and provide for bath tub with hot and cold water as well as for the necessary pump, piping, and drain. They do not provide for a closet in the bath room.

Where attic tanks are used they may either be lined with lead, or a galvanized tank is very satisfactory if it can be gotten in place. Lead lining is dangerous for tanks used for drinking or cooking water, but very good for rain water if used only for washing purpose. Lead is more soluble in soft rain water than in hard waters, so that care must be exercised in its use. Where galvanized tanks are used they should be set in a galvanized iron or lead lined trough to catch the condensed water that runs down the outside and which would otherwise cause damage to the ceilings of rooms below.

It is possible to run rain water from the roof directly into a tank in the basement from which it can be pumped to a tank in the attic with a hand pump where the family is not large. Such a system has been tried in many instances with excellent results.

Another plan for using roof water, which is more satisfactory in many cases, is to provide a tank in a small room of the second floor of the house into which the water is run directly from the roof and distributed by gravity to the rooms below. Such a plan necessitates a cut-off in the supply pipe so that the water may be run either into the tank oi outside to the cistern as desired. It is desirable with this plan to install a hand pump for pumping water from the cistern to this elevated tank during dry periods and it necessitates a tank holding at least twenty barrels to allow of sufficient storage to carry over all but the most prolonged dry periods. The house must be well built in order to sustain this weight. In all tanks installed within the house it is necessary to provide an overflow pipe to insure safety. This overflow may either lead to the drain or to a place where it may be used for watering or for further storage.

The most common type of water supply is that of an elevated tank supplied with a windmill. The tank is either elevated on a tower or in a building, and connected directly with the faucets and bath room as well as with watering troughs at the barn and in the lots. Such a system is in general the most practical where a large amount of water is desired. It has the disadvantages of danger from frozen pipes, of occasional water shortage when there is no wind, and of a considerable expense, although under average conditions it is one of the cheapest forms for the water supplied. It has the advantage of capacity, of requiring little attention and of a moderate cost for the water provided. Such a system will cost approximately $250 for windmill, piping, bath room fixtures, tank, pump, drain, and labor where the well is within 100 feet of the house. Attention is called to the desirability of using a galvanized iron tank rather than a wooden one, the latter being very difficult to keep from leaking.

The second general type of water supply is through a compressed air tank. There are various means of arranging such a system, but the general plan is to have an air tight tank, ordinarily of steel, located at a convenient place, usually in the basement or underground, into which the water is pumped against a cushion of air, the pressure of air raising the water to the desired height in the house. The tank is usually provided with an air pump for regulating the pressure or the amount of air contained. A pressure of ten pounds per square inch will raise water twenty-two feet, and a fifteen pound pressure, thirty-three feet.

The pumping power for a pressure tank may be either a windmill, a gas engine, or a hot air engine. An automatic regulator is usually provided which stops the pump when a desired pressure is reached.

The cost of such a system varies considerably with the size of the tank, with the kind of power used, and with the general plan, but it is usually from $50 to $75 more expensive than the elevated tank.

Such a system has many advantages in that water is supplied in large quantities wherever needed, it gives adequate fire protection, and where the tank is located in the basement there is little danger of freezing. It has the disadvantage of necessitating slightly greater expense in its installation, but it is by far the most satisfactory under average conditions.

In installing a complete system of water in the house one can figure the bath tub at a cost of about $22, the hot water heater at $8.50, the closet at $16, the vent from soil pipe to the roof at $6, single traps at $1.75, grease trap under the kitchen sink at $3.25, 1¼ inch galvanized iron pipe at 15c per foot cut to proper lengths, 1¼ inch lead pipe at 45c a foot, and kitchen sinks at $6 apiece. The cost of labor on a complete system will vary from $40 to $60. Where an air pressure tank is installed one can figure a twenty barrel size as worth $40 and a ten barrel size as worth $30, while an air pump will cost $7.50.

A new plan of air pressure supply is what is known as the Perry system. This system locates the air tank convenient to the power, and the engine or windmill simply compresses the air in this tank which is connected by pipes with a specially designed automatic pump in the well worked by the compressed air which forces fresh water from the well wherever needed. This pump operates only when water is drawn from a faucet, maintaining a constant pressure.

Under most conditions some form of the compressed air system is the most desirable if funds are available for installing it. The fact that it gives sufficient pressure to furnish considerable fire protection and that it has the added advantage of allowing the tank to be installed within the cellar or within a building where freezing can be prevented is of much importance. Where the same gas engine that runs the pump is also used for other purposes the expense of its installation is not much in excess of the ordinary windmill and tower tank method.

As to the details of installing a water system, there are a number of points that must be kept in mind. In the first place it must be recognized that the installation of anything like a complete system is a complicated matter and requires the knowledge of a competent plumber if the work is to be properly done. To be sure a man who is familiar with plumbing work and who can secure a set of plumber's tools may be able to install a satisfactory system himself, but unless he is naturally handy with tools the job will usually be one which will give trouble. For the smaller jobs a man with an ordinary amount of ingenuity and the necessary tools can do the work.

The white enameled bath tub is the most satisfactory form to buy at this time. These are made with a wide rolled edge in the same manner as the sinks and are in every way to be preferred to metal lined tubs. The difference in the cost is insignificant as compared with the greater satisfaction secured from them.

Wash basins or lavatories should be of the same material. The old fashioned marble slab top is not nearly so good as these modern white enamel steel types and is of equal or greater cost. They can be mounted against the wall or in the corner without the use of brackets which catch dust and dirt.

Where a closet is installed in the house the low down tank is more noiseless and easier to keep in repair than the higher ones. The ordinary white china siphon type of bowl is satisfactory. The soil pipe from the closet should be of four inch iron having joints sealed with oakum and lead. It must connect with the roof by an air vent. Since a closet forms a trap in itself there is no necessity for a trap in this soil pipe, although it is quite common to insert a large trap where the main drain pipe for the house leaves the cellar.

The matter of sanitary drainage and sewage disposal is a large subject in itself. There are various forms of septic tanks and other complicated devices for handling sewage, but these need be considered usually only in the largest systems. For most houses a four inch or six inch glazed sewer pipe into which the drain pipes empty as they leave the cellar is sufficient. This glazed tile should have cemented joints and it should extend for 100 feet or more from the house or beyond all danger of contamination of wells. From this point on the expense may be lessened somewhat by using ordinary red drain tile. The fall of this drain should not be less than one foot in the hundred, and two or three feet would be much better. For simple systems, this tile may empty in any convenient low ground where the sewage will be absorbed by the soil. It may, of course, be emptied into a stream, but this is more or less dangerous for people living below. One of the safest systems is to run this sewage onto a sand bed twenty or thirty feet square provided for the purpose, allowing the material to be absorbed in this bed. It is most satisfactory in larger systems to arrange two beds using them alternately. Another system is to empty the drain tile into several branches of tile on a lower level, these all running shallow and laid with open joints. If these are laid in sand so much the better. Whenever sewage is dissipated through loose surface soil the odor is quickly absorbed and, for all small systems especially, where a closet is not provided, the opening of the tile in an open drain or in any convenient low ground is sufficient. The main essentials are a tile of sufficient size with a good fall and cemented joints; a convenient area of low land on which the drain may empty. Care must always be taken, however, to preserve the drinking water from any possible contamination from this drain.

ACETYLENE LIGHTS FOR THE COUNTRY HOUSE.

A demonstration of the use of the acetylene light plant was given in the Engineering Building Thursday afternoon of the Conference week, by Messrs. Bowls and McVey. They have written a bulletin on the subject, which any one interested may obtain free by addressing the Engineering Experiment Station, University of Missouri, Columbia, Mo. Another bulletin, also for free distribution, on "Gasoline Lighting of Country Houses," will be issued by the same station in the near future.

HOUSE DECORATION.

(Miss Ella Victoria Dobbs, Manual Training Department, University of Missouri).

The term "House Decoration," calls to mind with most of us perhaps, first the pictures and whatever bits of ornament are used in addition to the purely useful tables and chairs; then we think of the kind, quality and style of the curtains, wall covering, hangings and rugs in their relation to decoration, and last of all perhaps, the necessary furnishings themselves are considered from the standpoint of beauty. I am sure we will all agree that the successful results are obtained only when all these elements are in harmony, and I am also sure that we must really begin at the other end of the list. Our efforts at decoration are evidences of our desire for the beautiful—but what is beauty? One says, "Beauty is in the eye of the beholder," which being interpreted, means that we find the beautiful only when we have the spirit of appreciation. Another says, "Beauty is indefinable, but we may at least learn something of the way in which it manifests itself," and this study of the ways in which beauty manifests itself we call art; but we are apt to think of it as a mysterious possession of a favored few and not as a thing that lies close at hand to be enjoyed by all who will.

Because it is this spirit of appreciation that lies back of all successful house decoration, I shall consider my subject quite broadly, and if I am able to help any of my hearers to get a clearer view and a stronger hold on the one or two controlling elements which enter into all that goes to make up the home beautiful, I shall do greater service than if it were possible for me in these few minutes to give a complete course in making rugs, stencilling curtains, constructing mission furniture, or any other useful factor in house furnishing.

It is sometimes easier to define a thing by telling what it is *not* than by trying to tell what it is. A few years ago a woman who had more money than refinement came to South California for the winter. She wished to make an impression on the public and rented a house which stood in a large yard adorned with much shrubbery and numerous urns standing on showy pedestals. I did not see the interior of the house, but she gave a glowing description of its two pianos, its wealth of rugs, pictures and statuary, closing with the remark: "It's very artistic, *lots of art,* you know." I wish she were the only one whose conception of the artistic is "lots of art, you know."

Our nation's fathers in the early days classed works of art as luxuries and placed so high a tariff upon them that only the rich could afford to buy them. As a natural result, the next generation grew up with the idea that Art is something which can be bought with money—that beauty is expensive, and *the more expense the more beauty.* For many years we have had the teaching of art listed in our school courses of study, but until recently the work has been confined largely to the copying of pictures or the making of pictures of objects in which the children felt no interest, and which had no connection with their lives except through the drawing book; and the drawing book was a thing to be hated, for a slip of the pencil might mean the eraser—the eraser was quite sure to mean an ugly blur, and a blur meant a low mark, and perhaps a scolding. A few little girls were able to produce pages filled with painfully exact lines and many curlicues, and were praised for their accomplishments; so there grew up in their minds that idea that fanciness and ornamentation are artistic and—the more curlicues the more art. To many of the boys art meant only a bugbear, a foolish waste of good time which might be more profitably spent making good kites or strong sleds.

It is perhaps small wonder in the face of these conditions that there are still some among us whose sense of the beautiful is either asleep or choked out, and who regard art as something that can be bought with money, and to be artistic is to have "lots of it."

Not long ago I chanced upon this quotation—

"Art is not a thing to be done, but is the best way of doing whatever needs to be done,"

And this expresses the idea which I have in mind today. This art is that delicate sense of fitness, of proportion, that power to do and say the right thing and at the right time; we frequently call it *good taste.*

The possibilities of house decoration range over a field as wide as the number of houses to be lived in, from the well-to-do builder who can employ a professional decorator, to the humble home whose beauty must be created from some goods boxes and a few yards of burlap and cheese cloth; but let us rejoice—beauty, like happiness, depends not upon the multitude of one's possessions, and with the right spirit as guide the simplest things may be made beautiful. Mr. Batchelder says, in the Craftsman, "To design is to give expression to an idea. This term implies an interesting, possibly a beautiful, at least an orderly expression of that idea, but first we must have the *idea.*"

The first question to ask one's self, then, before planning household furnishings and decorations is, What is to be the purpose of these rooms, what idea are they to express to those who come into them? A Columbia University professor enumerates seven reasons why people construct buildings, viz.: protection from weather, security from enemies, privacy, gathering places, monuments, expressions of taste, ostentation of wealth. The building of a home covers several of these, the first three in any case. Most of us wish it also to be a gathering place for our friends. Whether we think of it or not, it is bound to be an expression of our taste, and perhaps, some of us are not free from a desire to let the world know that we have prospered. All of these things are bound to show in a degree proportionate to that in which we possess them, for consciously or unconsciously, we are bound to express our real selves. If we try to express the thing which we are not, we are sure to betray ourselves; it is necessary here, as elsewhere, to "be what thou seemest."

The Craftsman quotes the following from Barry Parker's "Smaller Middle Class House:"

"The true method of making a room beautiful is to make all the necessary and useful things in it beautiful. So much is this true that it becomes almost impossible to design a really beautiful room that is to have no useful work done in it or natural life lived in it. An architect called upon to design a room in which nothing more earnest is to be done than to gossip over afternoon teas has a sad job; for a room must always derive its dignity or meanness from and reflect somewhat, the character and kind of occupation which is carried on in it. For instance, the studio of an artist, the study of the man of letters, the work shop of a carpenter, or the kitchen of a farm house, each in its position and degree, derives a dignity and interest from the work done in it. The things in the room bear some relation to that work and will be the furniture and surroundings natural to it; as the bench and tools in the carpenter's shop; the easels and canvasses in the studio; the books and papers in the study; the bright pans and crockery in the kitchen. All these lend a sense of active, useful, human life to the room, which redeems it from vulgarity, though it be the simplest possible; and no amount of decoration or ornamentation can give dignity or 'homeyness' to a room which is used as a show room, or in which no regular useful life is lived. For in the work room all things *have a place* by reason of their usefulness, which gives a sense of fitness and repose entirely lacking in a room where a place has obviously *had to be found* for everything, as in a drawing room.''

The idea then, upon which we are to base our plans for furnishing and decoration is to be drawn from the purpose which the rooms are to serve. That purpose is a personal matter of individual choice, but in the expression of it we may look for help from others.

A glance over a few modern house plans reveals one feature in which this idea of use has worked at least one revolution. The older plans all provided for parlors and drawing rooms, while the newer ones have a living room instead, and the change is most welcome. The word *parlor* suggests the stiff and stately arrangement of the most ornate furniture the house can afford, selected not with a view to comfort, but for display; a room darkened and close shut from dust and fresh air in summer, and cold and cheerless in winter, into which the formal caller is ushered for a brief stay, and in which the distinguished visitor is entertained, but into which the real life of the home never enters. We put on our most formal manners when we enter the door, we seem to have lost all the bright thoughts we had before, and talk in our most stilted language on the driest of topics; and we would not for the life of us disturb any of the carefully arranged furnishings of the room. If, in a moment of boldness, we do pick up a book from the table, we are careful to return it to the same spot and in the same position; and what a relief it is to get out into the sitting room or the kitchen, or whatever part of the house is warmed and cheered by the daily life of busy people.

The very name, living room, calls up a much more delightful picture. It is bright and cheery at all times, and even when deserted, one feels the warmth of recent occupation. At its best, it is large enough to permit all the necessary furniture without an effect of crowding, and this furniture is plain, simple and strong in its construction, suggesting use and comfort. There is always a table large enough to allow the whole family to gather about the low light upon it when books and papers claim the hour. There is generally a couch with an inviting heap of pillows, and its crowning glory in the winter is its cheery open fire; and it is well if the fire place is flanked by a cozy settle which invites heart-to-heart talks while the last log burns to coals and falls apart. There are convenient book shelves, and perhaps a piano; there are a few well-chosen pictures on the walls, and soft draperies at the windows. Whatever the predominating color, the tones are soft and restful.

Do you live in such a room? If not, why not? for the essentials depend not at all upon the size of your bank account, but upon the purpose you have in mind and the way in which you express your idea. If you can afford oak finishings and oriental rugs, well and good; if not, the essential features may be obtained from commoner materials. I see no reason why the best should not be used on the farm as well as in the city home. Have the best your taste demands and your purse will buy, but be sure that you may have beautiful things at small cost of economy if necessary.

Mr. Batchelder says further: "Our expression of the idea will be beautiful in direct ratio to our control of our tools and materials, and our appreciation of the principles underlying design. * * * The beautiful thing is always sane and orderly in its arrangement, clear and coherent in its expression, frank and straightforward in the acceptance of the conditions imposed by use, surroundings, tools and materials. These are things we can analyze and find simple rules for our guidance, and from simple beginnings, through continuous experiment we *try for order* and *hope for beauty."*

This sounds somewhat technical on first reading, and I imagine I hear some one thinking—if success depends on knowing the principles of design then my case is hopeless, for I never had a drawing lesson in my life, and I do not know a thing about design."

Let us see: He says, "The beautiful thing is frank and straightforward in accepting the conditions of use, surroundings, materials," etc. I think he means about this: If it were necessary to have sleeping accommodations in a room which did not permit a bed, he would use a couch, which is frankly all it pretends to be, and not a folding bed, which pretends to be a book-case or writing-desk, and rarely has any beauty in its proportions. I am sure he would have his gas fixtures show that they were meant to burn gas and not add a bit of white glass under the pretense that he was using candles. He would enjoy a beautiful hand-carved chair or chest, but he would not tolerate one that had machine-carved ornaments glued on after the fashion of much that is in our stores today. Above all, he would not paint a landscape or a spray of flowers on a chopping bowl and tie ribbons on a guilded toasting rack and hang them up for parlor ornaments.

As to the principles of design, while they furnish study for a life time, it is possible to begin with a simple thing which we know and can appreciate, and by applying it every day, find its connections which will make clear other things we had not noticed before.

Most household problems can be reduced to two broad principles—space relation and color harmony. Space relation we must deal with at every turn. The table is to be set for a meal; shall we deposit the dishes containing the food in uninteresting confusion at the end nearest the kitchen door or distribute them with some thought of balance? Some pictures are to be hung: shall we put this small one in the center of this large space where its smallness will be emphasized, or find a smaller space which it seems to fit? Or, if we wish to group several small pictures, shall we take the stiff angles of a square or diamond, or choose freer lines suggested by the shape of the pictures themselves? Shall we hang the long, narrow picture in the broad space over the mantle or between the window and the corner of the room, where there is a narrow space that demands it? If you will study the relation of lines and spaces you will find that lines running lengthwise of a space seem to lengthen it, while if broken by cross-lines it seems shorter. If your ceiling is too high, bring it down in effect by lines around the room—a deep border, a high wainscote, etc.; or, if it is too low, omit cross lines as far as possible. But, perhaps you are thinking, "I can set the table and hang my pictures, but I do not understand color harmony. I see things that please me, but I cannot select them." If so, though color sense comes naturally to only a few, and is largely a matter of education, we are never too old to learn. Perhaps the most helpful plan is to study and analyze the things we know to be good or bad, and see why it is that one is good and another bad. What are the combinations that always please or displease? A little experimenting with a box of water colors will be helpful; making spots of various combinations of color and noting the effects. It will be found that all the colors in the box, mixed together, will give a dull grey, and that the best colors you will get will be the dull tones which are softened by a little of nearly every color in the box. The more we study the good things we are sure of, the faster will we grow in power.

The key-notes, then, for successful house decoration are, first, usefulness; second, simplicity; third, a pleasing division of space combined with harmonious coloring.

I think Ruskin says somewhere, "Have nothing in your house which you do not believe to be useful or believe to be beautiful." If the really useful things in a room are simply and substantially constructed to meet the needs they are to fill, they will have a dignity which is beautiful. Our greatest fault, I think, lies in the accumulation of useless things which we allow to crowd our rooms. If we can only train ourselves to enjoy some empty space which gives a feeling of *bigness* instead of the pettiness we so frequently meet, much will be accomplished. When we turn our attention to coloring, if we avoid strong, crude colors and confine ourselves to neutral tones, we shall not go far wrong. I have not said much specifically on the subject of pictures, wall coverings, hangings, etc., because it is the whole effect which is important, and no one thing can be wholly good or bad except in its relation to the things which surround it. Nor have I mentioned the "green things growing," which add so much, a graceful fern, a trailing vine, and, at the season when it is possible, a few cut flowers; not bouquets, but a rose or two in a slender vase, a bunch of violets in a low bowl; these give a touch of refinement found in nothing else.

And last, but by no means least, the *homemaker* herself—she is the crowning touch which must make or mar the effect of the whole. If her appearance is not pleasing, her manner not gracious, the otherwise charming effect will be spoiled. If she is all that the term "home maker" implies, she will be in full harmony with her surroundings, because they will be the expression of her very self, and her influence will create that happy, restful atmosphere which is the chief factor in all that goes to make up the real home.

PICTURES FOR THE HOME.

Dr. John Pickard, Professor of History of Art, University of Missouri, gave an illustrated lecture on this subject by the use of the stereoptican and lantern slides. While he showed a very wide range of subject, including great portraits, religious pictures, pictures of everyday life and landscapes, he confined himself entirely to illustrations from the work of American painters, demonstrating the fact that we can claim to have an American school of art which may be favorably compared with the art of any other nation of our times.

In showing these various classes of pictures, the thought was brought out that art is not only a desirable thing to have in the home, but that art is one of the most practical and necessary accompaniments of daily life. We are all striving not merely for the bread which perisheth, not merely for clothing and for shelter, but we are striving for something which shall minister to the larger needs of humanity, and in this reaching forth after the ideal, the splendid visions of the great artists are most inspiring and helpful. In such a great portrait as Stuart's portrait of Washington, or in such a fine religious painting as that done by John LaFarge, in such fine inspiring figure subjects as those by John W. Alexander, in such splendid marines as those of Winslow Homer, in such beautiful landscapes as those by Dwight W. Tryon, or Childe Hassam, we may find suggestions of beauty that shall give elevation and charm to the whole daily life, and the beneficial influence of those fine works of art felt and seen every day throughout the developing period of childhood and youth, cannot but have a wonderfully fine effect on the formation and development of character. Such fine reproductions of these pictures can be had at such reasonable rates that there is no longer any excuse for the cheap chromos or the tawdry pictures which have so often defaced the walls of our homes. In art, as in everything else, the best is none too good. The speaker earnestly recommended that our homes should contain reproductions of the fine things in works of art, and particularly of the fine things which have been done by our American artists.

He suggested that there were various firms from which such pictures could be obtained, among which might be mentioned: The Copley Prints of Boston, Massachusetts, and reproductions by famous American artists from N. E. Montross, 372 Fifth avenue, New York City, or William Macbeth, 450 Fifth avenue, New York City.

PRINCIPLES OF ART APPLIED TO DRESS.

(Miss Calibel Ingels, Department of Home Economics.)

The same principles which make pictures, architecture and sculpture good, also determine the pleasing quality of clothing. Artistic dress means the conscious or unconscious use of the rules of balance, harmony and rythm, of size, shape, line and color.

Our ideas of the artistic in dress are much affected by the prevailing mode. For that reason no one can say this is absolutely good and will be altogether pleasing in a hundred years from now. The advocates of the dress reform twenty years ago designed artistic clothing, which looks odd today, though not so much so as the really stylish clothes of that time. Therefore, although we cannot be independent of fashion, we can choose from current styles those which are most becoming to us, and modify these in order to make them even more beautiful. In modifying styles and emphasizing the really good trend of them, we get clothes which will look well longer than those which are at the height of an exaggerated fashion. By this moderation we are creating a better public opinion, and this may react so that designers will give us their best efforts in the highest sense. The producers will not continue to put forth monstrosities in the way of clothing unless the people like the horrors sufficiently to purchase them. We seem to *want* hair rolls and sanitary rats.

It is very interesting to notice the difference in the proportion of the hair to the face now compared to what it was ten years ago. In spite of these differences, caused by the prevailing mode, there are some principles which can generally be applied to advantage. It is noticeable that children have the eyes half-way between the chin and the top of the head, while older people, as a rule, have the eyes nearer the top of the head. A middle-aged woman may look much older if her hair is parted in the middle and drawn tight down on each side of her forehead, instead of being fluffed out around the face and arranged in a soft pompadour, which makes the top of her head seem higher, so that the eyes are seemingly placed half-way between the chin and the top of the head. (Notice the difference between the heads in Figures 1 and 2.) Sometimes a short, broad woman of substantial dimensions, parts her hair and smooths it well down at the sides, and to give herself height, erects a little pointed knot of hair on top of her head. She could better gain height by a little pompadour, for this top-knot above the broad face is as inappropriate as a church steeple on a bungalow. Who does not remember the young girl who followed the extremes of fashion, and, in the days of the high pompadour, erected such an edifice on top of her head, that she appeared as a rabbit looking out of a brush

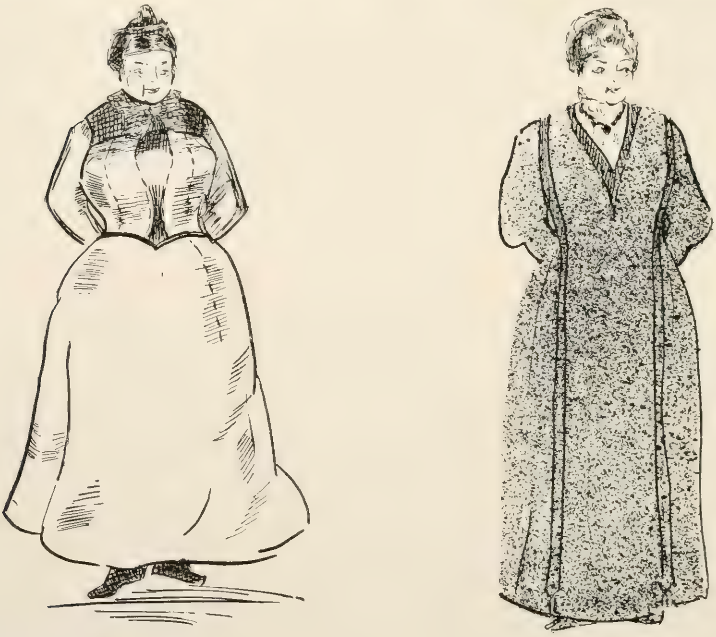


FIG. 1. "Like a church steeple on a bungalow."

FIG. 2. A soft pompadour makes a good frame to the face, and adds height.

The large woman should wear long sweeping lines that bring out her strength.

heap. As in all things, the way of the wise does not lead by extremes, and here the best rule in dressing the hair is to be inconspicuous and to be careful to maintain good proportions.

Closely related to the proportion of the hair to the face is that of the hat to the face. A very large hat makes the face insignificant, and a little button of a hat has no dignity and makes a large face seem swollen. What is a large hat in times of hats being all somewhat small, is a mere bagatelle in the days of the "Merry Widow." Therefore, the question of the size of the hat is a relative matter and one is safe in choosing one which is not conspicuous in either way.

The ancient Greeks made statues in which the length of the head was contained seven times in the whole length of the figure. Most civilized people have heads which are too large to meet the requirements of this ideal. There is danger, therefore, in our dress in using those effects which enlarge the head and dwarf the appearance of the body. Needless to say, the woman with a squeezed waist and narrow chest contrasted with the head built out to gigantic proportions by means of large hair rolls and artificial puffs is a civilized monstrosity.

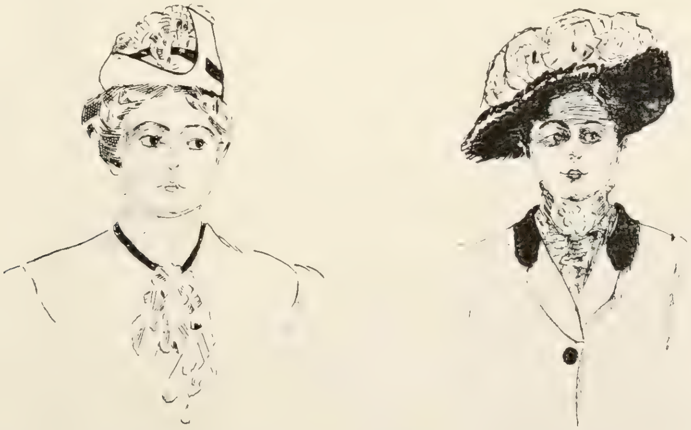


FIG. 3. FIG. 4.

"A little button of a hat makes a large face seem swollen."

In the great works of art involving the portrayal of the human figure, the trunk is not conspicuously divided by the drapery or clothing. How would the Winged Victory appear in a shirt waist, which always, if the waist is of contrasting color with the skirt, divides the body into two parts. In our modern clothing, for the sake of convenience we must have divisions, but we should strive to make these necessary evils as inconspicuous as possible. If one has to wear a shirt waist and skirt of strikingly different color and texture, it is well to remember that a belt to correspond to the waist will make a short waist longer, and a belt to match the skirt will make a long waist appear shorter. If the color of the skirt is repeated in the tie, the division is not so abrupt. The jumper dress has the benefits of the shirt waist, while the body is not conspicuously halved.

Straight lines have the same charm as arts and crafts work and Egyptian drawings. They are especially suited to large, noble figures. On the other hand, curves are more suave and expressive of aesthetic qualities. The lines of the human figure are long curves, most of which are vertical. Nobody could wear many lines going round and round the body like hoops on a barrel or stripes on a barber pole. A large, massive woman should keep her own beauty and not try to wear a great number of delicate lines suitable only to a sylph-like form. In nature the delicate traceries are upon frail things, such as the veins in the leaf, or the lines in a butterfly's wings.

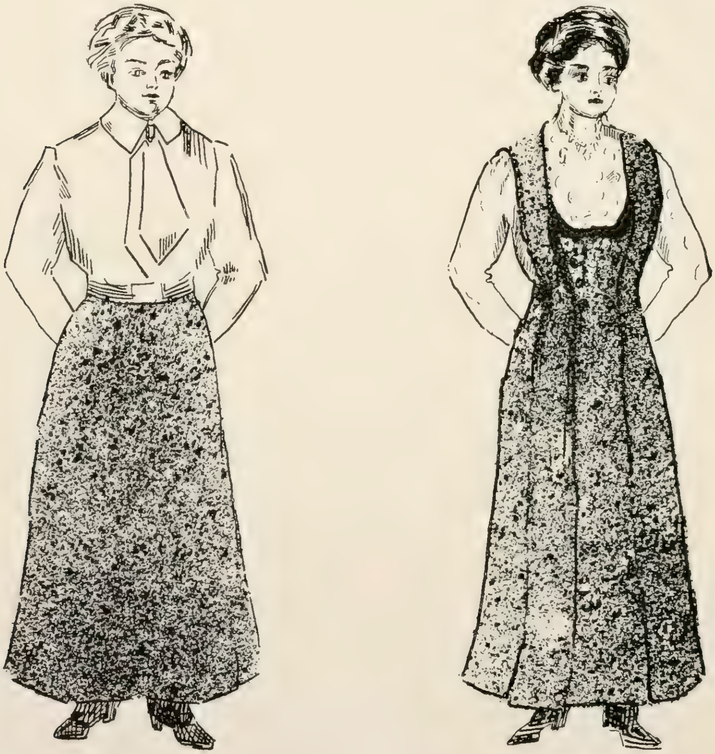


Fig. 5. Fig. 6.

A shirt waist cuts the figure in two.

In the belts of gowns, the lines straight across the waist makes the waist look larger than a line which curves downward very slightly.

Lifting the middle of the belt line in the back has a graceful effect also. This is because the horizontal lines in dress must be alleviated in some way on account of their being at a variance with nature. In broad women the line of the yoke may be sloping, so as to repeat the most delicate part of the curve of the jaw in order to call attention to beauty of shape rather than mere mass in the face. With the slender person with narrow shoulders, a yoke may be broad. With a flat figure it is especially urgent that the yoke should be of light color. The light yoke not only takes the shades and lines out of a face, but makes a strong chest effect by producing an appearance of roundness.

In the middle ages the people used rich and coarse materials for their clothing, thinking that the heavy texture would make the skin look thin and fine by contrast. They cared little for the body or for its shape, and were more interested in the face because there they thought the soul shone out. Did you ever observe how delicate a fine face looks above a velvet gown? The modern idea of texture is that the dainty, light materials reflect their own lightness into the face. Undoubtedly some people look fairer in white shirtwaists than in coats of velvet or monk's cloth. Since both the old and the new theories of texture have their good points, how can we be the heirs of all the ages and profit by both. Rembrandt seems to have done this in most of his portraits. Often he painted a subject in a dark hat and heavy coat with a white lace collar to reflect light into the face. The soft lace collar or jabot besides reflecting light, makes a gradual transition from the light face to the dark garment. Also, the harmony between these fluffy effects and that of fluffy hair is very noticeable. For the same reason soft hair is becoming. When it is newly washed it may be difficult to keep in place, but its soft texture makes the gradual transition from the mass of the hair to the face and is, therefore, very becoming.

There is no point about clothes which is the subject for more diversity of opinion than the colors which combine well with different types of people. You hear a friend say, "Now, she ought to wear blue to tone down her red hair," or, "Why does such a yellow girl wear yellow." It is interesting to apply the theory of color to clothing. According to this theory, red hair, which is really orange, will look even more orange with a blue or violet coat or hat. A dull shade of blue will, of course, not make the hair appear as carrotlike as will a bright shade, although nearly all the shades of blue and violet, blue-green, are very discordant with decidedly red hair. Bright shades of pink are especially trying with red hair. The closest artistic harmony is with like things, and with red hair some shade of brown is generally becoming.

Blondes have a great danger of making their hair appear dull by wearing bright or strong yellows. Those having neutral brown hair should be careful that the browns they wear are yet more neutral. Blue and violet will often bring out the golden quality of the hair and have also the advantage of being like the blonde's eyes. Violet and lavender are generally trying with sallow complexions. The yellows make the dark hair appear more black and will often cause a sallow complexion to appear more fair. This latter is on the principle that a dull shade of yellow will appear less yellow when placed beside a bright shade. It is generally safe to match the color of the eyes somewhere in the clothing. Often this may be most effectively done in the trimmings.

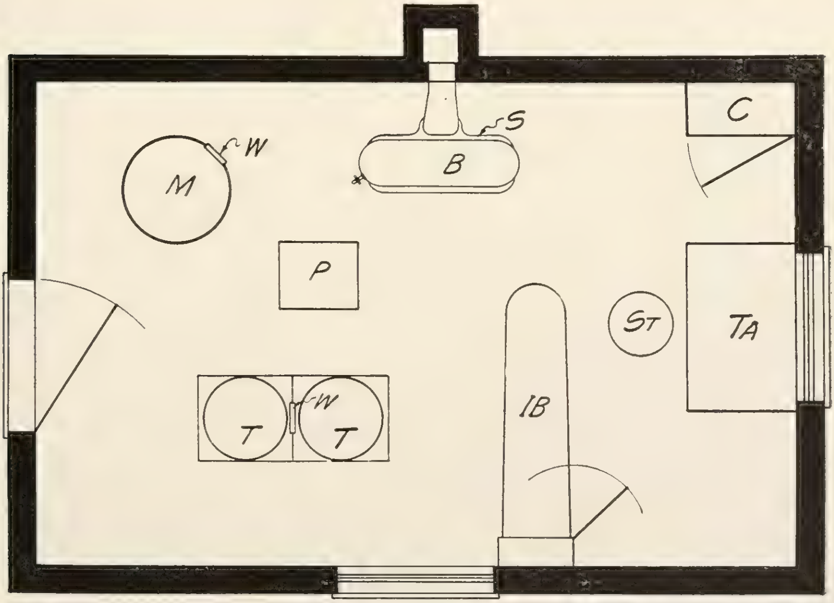
This brings us to the important questions of repetition. There is often a very pleasing harmony obtained by repeating each color of the face and hair in the dress, even two or three times. For instance, a blonde girl might have a dress of pongee color slightly duller than the golden color of her hair, and have in the trimming the blue of her eyes and a mere touch of pink, slightly paler than the color in her cheeks. A hat worn with the dress might combine all of these colors and if green leaves were used with the flowers on it, the pink of her cheeks would be even more noticeable. In this way there would be a harmony of color without monotony, the combination having the same interest as the delicate play of light on an iridescent shell.

Then, if one would be artistically clothed, she would use the prevailing style in so far as would keep her from being conspicuous and with such modifications which would enhance her own best points. Our friends are those who forgive our faults, and see the full worth of our virtues. Our clothes then, should be our friends in that they do not emphasize our faults, and in that they bring out the best qualities in our appearance. The large woman's clothing falling in long, sweeping lines brings out her strength. We are enabled to see that here is a glorious, living Juno. A girl who has a pug nose may also have beautiful brown eyes, but if her hat points to her nose we will see that impudent feature and very little else. If her hat and her dress repeat the color of her eyes we are not pained by the plainness of her face but happy in appreciation of the soul which shines out of her glorious eyes. The body is the temple of the soul. This implies that it is a work of art and that it is sacred. How closely the clothing and the body are related. Are the clothes then unworthy of our consideration and should we not take thought that they are beautiful? After all good taste is only applied intelligence, and to suit our individuality we must plan then to harmonize with ourselves and our surroundings.

LAUNDRY EQUIPMENT.

(Miss Ilena Bailey, Farmers' Institute Lecturer.)

The cleaning of clothing by means of soap and water has come to be of such importance that one day a week is set aside as wash day, unless the housekeeper is fortunate enough to be able to send her laundry out. Many are the frowns caused by the rainy Monday or the failure of the washerwoman to arrive on the appointed day, and thus disarrange the housekeeper's program for the week.



M IS MACHINE S, STOVE B, BOILER C, CUPBOARD TA, TABLE
ST, STOOL IB, IRONING BOARD T, TUBS W, WRINGERS P, PUMP

A variety of methods of laundry management present themselves. All may be sent out to the steam laundry, the housewife paying by the piece; paying at rough dry rates and doing the ironing at home; or having flat work done at the laundry and the starched clothes brought home rough dry. Having laundry done by the piece is costly, and the other methods relieve the housewife of only a part of the labor and time. A new method is being used in some places—the wet wash. The clothes are returned wet, to be dried at home. The average price is fifty cents for a family clothes basketful. However, this leaves the work only half done. Aside from the expense of steam laundry work, there is the careless handling of the clothes causing them sometimes to be torn; or to be mixed with other washings. Also the clothes are out of use for one week. But the greatest objection is that not all the clothing is sterilized. Another method of managing the laundry work is to send it out to a washerwoman. This has some of the same disadvantages as the steam laundry except that it is less expensive. The clothes are often not properly washed and rinsed so that they are returned looking grimy, often scorched in places and not properly sterilized. So as far as results are concerned, the washerwoman is often worse than the laundry. Some housewives avoid these difficulties by hiring the work done at home. So far as desirable results are concerned, this is probably better than either of the previously mentioned methods. However, the method used by many housekeepers and especially those who live on the farm, is to do it themselves.

The aim in the laundry room exhibit has been to show how the equipment already found in most homes, can, with a very small additional expense, be arranged more conveniently.

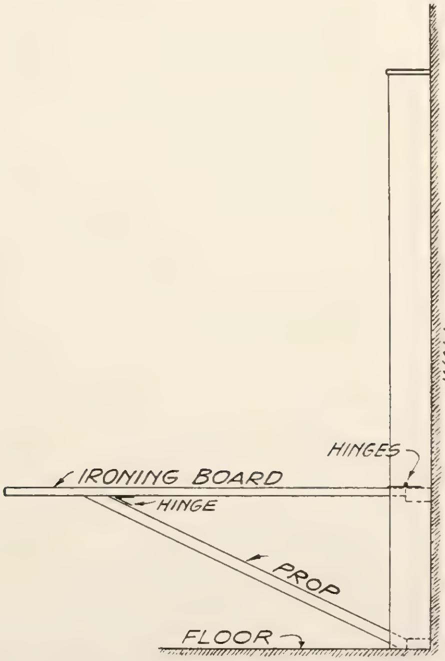
This room could be one in the basement with cement floor and walls, or what we more often find, a part of the woodshed or an unused room near the kitchen. Almost every house has a different problem so the exhibit here is only suggestive. You will have to adapt it to your own home. It would be advisable to have it shut off from the rest of the house as much as possible, so that the heat and steam will not reach other parts. If the house has plumbing connections, nearness to these would be considered in planning the room. Another point to consider is ease of access to the back yard. If the house has a side door rather than a back door, this makes extra steps in carrying the clothes to and from the line. The room used for the exhibit is as small as possible and yet have a place for everything. There is usually only one person who does the washing. However, two could work in this room without getting in each other's way. The windows are arranged so that light is admitted from two sides. The ironing table, ironing board and rinsing tubs are placed so as to secure good light.

The walls are covered with a tile design of Sanitas, which is an oil cloth hung like wall paper. A smooth painted wall would also be good.

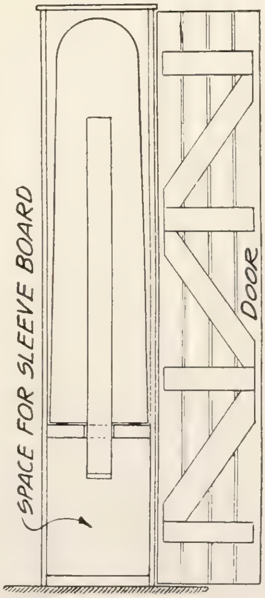
Inlaid linoleum makes a durable and easily cleaned floor where cement cannot be used.

The hardest work of wash day is the carrying of water to the tubs and carrying it out again. Another disagreeable feature is the carrying of clothes from one tub to another and thus dripping water over the floor. It is gratifying to know that every year more farm houses are having water systems installed. However, if there is not water in the house, with small expense a cistern pump can be put in and a pipe connect with a cistern just outside the house. This pump is placed on a small stand 18x22 inches. Underneath this stand is a bell trap with a drainage pipe for carrying the dirty water away from the house.

In the plan, M represents the washing machine, S the laundry stove, and B the boiler with faucet attached. The pump is arranged between the tubs and machine so that no steps need be taken to turn a pailful of water into the boiler or the machine. C is a cupboard for laundry materials and D the space for the dish pan, I the shelf for irons, S', for starch, S'', soap and bluing, M for materials for removing stains. On the side of the cupboard is a place for the boiler to be hung when not in use—also for the cover. The table 2x3 feet is used for flat work such as sheets, table-cloths, napkins, towels, handkerchiefs, etc. The table has a pad of several thicknesses of Canton flannel over which is a cover of unbleached muslin of one thickness—unbleached, because this is more durable than the bleached. The cover is the size of the table top. White tape is stitched on each corner in the shape of a right angle opposite to the corner of the muslin, and the ends left long enough to tie around the table leg. This holds the cover and pad firm and smooth, and allows it to be removed when necessary.



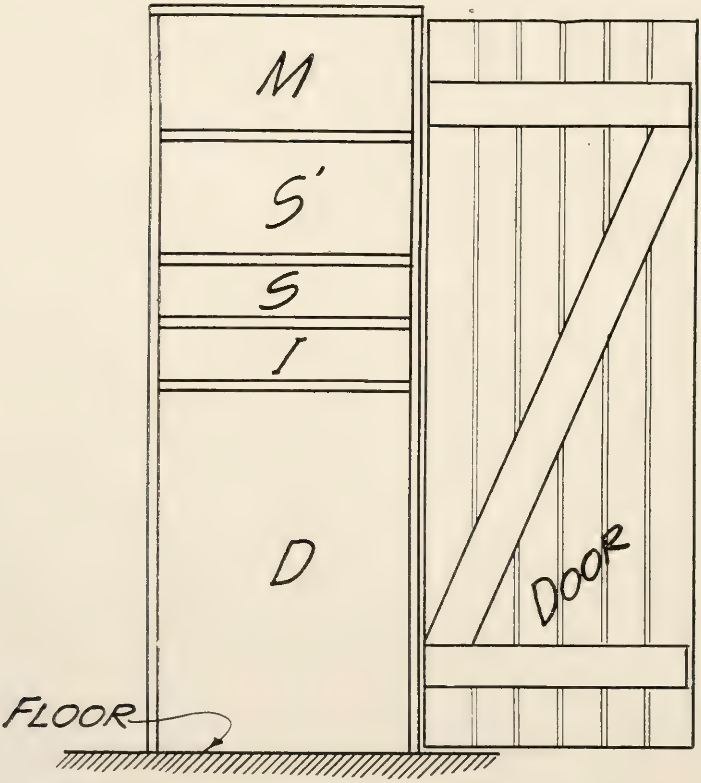
SIDE VIEW - READY TO IRON.



FRONT VIEW
BOARD PUT UP

In the small drawer of the table are kept the wax and small cloths often needed for dampening, cleaning, etc.

On the side wall, opposite from the stove, is a cupboard for the ironing board. The ironing board is fastened by hinges to cross piece 32 inches above the floor. About one foot back from the narrow end this board has a support fastened by hinges so that when the ironing board is turned up into the cupboard, this support drops back into the case also. When the ironing board is in use, it is supported by the prop resting in the angle of the floor and wall. The latter is protected by a wooden block. The sleeve board is kept in that part of



M IS SPACE FOR STAIN REMOVERS

S', STARCH S, SOAP

I, IRONS D, DISHPAN

FRONT VIEW OF CUPBOARD.

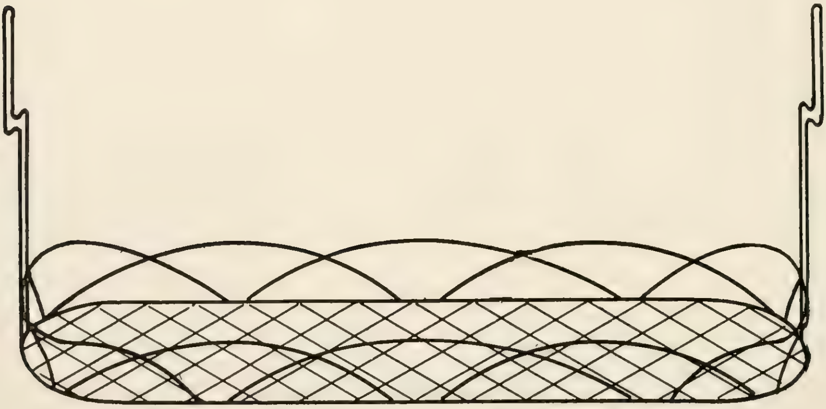
this cupboard between the cross piece and floor. The sleeve and ironing boards have removable shaped covers fastened underneath with tapes. The sleeve board is very useful not only for ironing sleeves, but also for the narrow parts of waists, jackets, and children's clothes.

On the same side of the room as the ironing board cupboard, is the bench for the tubs. If this bench is suited to the height of the woman who is to work on it, there need be no back bending work. The bench in this room is 22 inches high. Most women would probably need it higher than this. A support for the wringer between the tubs is made of a cross piece between two uprights. This is high enough to allow the tubs to be pushed under the wringer and thus save water from dripping over the floor when wrung from the clothes. The wringer thus serves for two tubs and may be changed so as to wring from either.

The old order of housework was to wash on Monday, iron on Tuesday, bake on Wednesday, etc. Would it not be easier to get the clothes mended, sorted, stains removed and clothes put to soak on Monday? Then on Tuesday, the washing will be easier than if crowded into Monday. All rents, except those in the stockings, should be mended before washing as the processes of washing, and drying in the breeze frays the edges so that they are much harder to mend. Stains should be removed before washing as the alkali of the soap often sets the stains so that it is almost impossible to remove them. The body linen, soiled towels and clothes should be put to soak, the soiled portions being rubbed with soap, then rolled within the garment. This prevents the dirt from spreading. The handkerchiefs, by themselves, should be put to soak in a solution of boric acid in a separate basin or pail and on Tuesday washed and boiled about twenty minutes before being put with the other clothing. This is done to thoroughly disinfect the handkerchiefs. The cleaner white clothes and linen may be washed without previous soaking. The soiled colored clothes of fast colors may be soaked in warm water without soap or other alkali.

On Tuesday morning, the soaked clothes will be removed from the tubs and the clean white clothes washed through warm suds in the machine, then put into warm water in the boiler. The wringer on the machine saves moving the one between the tubs over to the machine. The nearness of the machine to the boiler saves steps.

The copper-bottomed boiler has a galvanized wire drainer with wooden handles. This is placed in the boiler before putting in the clothes. Before lifting the clothes from the boiler, the drainer is rested on the sides of the boiler so that the water drains out of the clothes. They are then lifted over to the tub, where they are rinsed in plenty of clear warm water and wrung into the bluing water. A clean wooden cover or a galvanized wire basket to fit a tub would be a great convenience if one did not wish to empty the water in other tub or to lift it off the bench. This would make it possible to wring the white clothes out of the bluing water and still have others in first tub. A rubber plug in each of the tubs, such as are in the porcelain stationary tubs, allows the water to be easily removed. A 2-inch galvanized pipe with two elbows and a wire hook fastening over the side of the tub to hold the pipe in place, carries the water from the tub to the bell trap under the pump stand. The second elbow turns the waste water down into the trap.



CLOTHES DRAINER.

There often come days when the clothes can not be dried out-of-doors. Often they are hung around the kitchen stove where they are usually very much in the way, and often get soiled. A dryer made similar to a large wheel and hung by small ropes over pulleys on the ceiling makes it possible to dry the clothes in the laundry room. The object of the pulleys is to let the rack down within easy reach and then pull it up to the ceiling. This gives the clothes the advantage of the warm air at the top of the room and also gets them out of the way as much as possible. The drying rack will not be large enough to dry an entire washing at once, but as the clothes will dry quickly, the rack will be a great improvement over wet clothes or drying around the kitchen stove.

Experienced housekeepers will find variations of these plans to suit their needs. Stationary galvanized or stoneware tubs would cost about twice as much as the galvanized tubs with stoppers and drain pipe, but would be more satisfactory.

Below is a list of the furnishings used in this laundry room with the initial cost and the average number of years of service, so far as can be determined without experiment, also the cost per year.

Article.	Initial Cost.	Years of Service.	Cost per year.
Machine	$10.00	10	$1.00
2 Wringers	10.00	8	1.25
2 tubs	2.30	4	.57
Irons	2.50	10	.25
Stove	6.00	6	1.00
Boiler	2.00	5	.40
Drainer	.42	10	.04
Pump	4.00	10	.40
Table	1.50	15	.10
Ironing board	1.00	10	.10
Sleeve board	.50	10	.05
Stool	1.00	10	.10
Clothes horse	.85	2	.42
Bench	1.50	10	.15
Pail	.25	5	.05
Basket	.85	5	.17
Pads	.36	5	.07
Covers	.36	1	.36
	$45.39	....	$6.48

Almost every home, especially every farm house, has all of the furnishings mentioned except the sleeve board, stove, pump, drainer and the extra wringer. These make an additional initial cost of $16.92 or an average yearly cost of $2.04. The convenient arrangement of the laundry room will probably enable the housewife to do the work in one-fourth less time than with the arrangement now found in most homes. A hired woman expects to receive for the average washing and ironing of a family of five, from one and one-half dollars to two dollars plus the cost of two meals at twenty-five cents per meal, making a conservative estimate of cost at two dollars per week. Now if a convenient arrangement of the laundry room saves even one-fourth the time or fifty cents per week, it will make a saving of twenty-six dollars per year, or more than twelve times the cost per year of the extra articles. Stating it another way, the saving would pay for one and one-half times the initial cost of these articles. A good business manager would lose no time in making an improvement that would be such a saving, and it is high time that good business principles were applied to housework.

The original plan for this exhibit was to show two laundry rooms —one for convenient arrangement of laundry equipment now used in homes and the other with machinery run by gasoline power. But being unable to get the loan of suitable machinery and it not being practicable to purchase such, only an electric power washer with wringer, loaned through the courtesy of Mrs. Furtney, and a hand power cold mangle, loaned through the courtesy of the manager of the U. D. Club, can be shown. Those who have used the power washers say they are satisfactory and are great time and labor savers.

The gasoline power machines are very similar to the electric machines—one operating by electric current and the other by a belt from gasoline engine.

The mangle saves much time on flat work and some of the larger every day clothing. This would leave only the starched clothes to be ironed by hand with the alcohol iron. A cold mangle necessitates the clothes being partly dried and then redried after mangling. A heated mangle would dry the clothes as in ironing. A hand power mangle requires two operators, one to put in the clothes and one to turn. With a heated power mangle, one person could do the work very well. At present there seems to be no mangle heated by alcohol or acetyline, but it is hoped these fuels will be applied to mangles in the near future.

The porcelain stationary laundry tubs are easily cleaned and offer no chance of staining the clothes. The ironing board and sleeve board used would be the same as for the laundry room mentioned above.

A power laundry equipment would be somewhat expensive in initial cost but would pay when years of service and the saving of time are considered, especially on a dairy farm. This power laundry room could be arranged adjoining the milk room so as to be near the engine and water. To lower expenses, this power laundry might be installed on the co-operative plan or rented out to neighbors for a small sum per wash.

Below we give the initial cost, years of service, and cost per year as nearly we have been able to determine same for power laundry.

Article.	Initial Cost.	Years of Service.	Cost per Year.
Machine Wringer	$50.00	15	$3.33
2 porcelain tubs	28.00	30	.93
Heated mangle	60.00	30	2.00
Alcohol iron	5.00	10	.50
Stove	12.50	5	2.50
Boiler	2.00	5	.40
Drainer	.42	10	.04
Table	1.50	15	.10
Ironing board	1.00	10	.10
Sleeve board	.50	10	.05
Stool	1.00	10	.10
Clothes press	2.00	4	.50
Basket	.85	5	.17
Covers	.36	1	.36
Pad	.36	5	.07
	$164.49	....	$11.15

Our work on the laundry problem is not yet completed. We hope to offer to the housekeepers of Missouri the best plans for laundry work, considering time and labor, and materials. Any suggestions and experiences you may have to offer toward this end will be appreciated.

The Cornell Reading-Course for Farmers' Wives has a valuable bulletin No. 3 in the Sanitation Series 1 on The Laundry.

For cost of a gasoline power laundry we are indebted to the First Annual Report, State Dairy and Food Commissioner, Missouri, 1907.

FOOD PRINCIPLES AND THEIR USES IN THE BODY.

(Mrs. Ivy Harner Selvidge, Columbia, Mo.)

''Foods are divided into two general classes, the inorganic foods and the organic foods. Inorganic foods are subdivided into water, and the mineral salts. Organic foods are subdivided into proteids, starches and sugars, and fats and oils. The compounds of which the body is made up may be classified in exactly the same way. In the process which food undergoes in preparation for the body, man has some important work to do. Two things may be said to affect food and help get it ready for the body to use. The first is the application of heat to it, either in the process of ripening which is effected by the natural heat of the sun, or by the application of artificial heat in the processes we call cooking. The second important factor in the preparation of food for use in the body is digestion. In order to fully understand the effect of the first it is necessary to know something of the last, that the work of the former may aid the latter process.

''The alimentary canal is a tube running through the body. It is divided into the mouth, the aesophigus, the stomach, the small intestine and the large intestine. Food is taken into the mouth, where it is acted upon mechanically by the teeth, which grind it into small pieces, and the saliva which moistens it and thus prepares it to slip down the small tube to the stomach. The most important action in the mouth, however, is chemical. The saliva, a watery alkaline fluid, is secreted in the mouth by three pairs of glands, the sub-maxillary, the sub-lingual and the parotid. Saliva contains two enzymes, or unorganized ferments, which act on certain foods. These enzymes are ptyalin, which changes cooked starch into sugar and sucrase, which changes ordinary commercial sugar into glucose. When either starch or sugar is changed into glucose it is ready to be absorbed by the blood vessels. Ptyalin is not often found in the saliva of children less than nine months old.

For this reason they should be given no starchy foods before that time. It is customary to emphasize the thorough chewing of meats where the effect is only mechanical; but it should be insisted upon also that children learn to chew starchy food well because of both the mechanical and chemical effect of the saliva on them.

"Leaving the mouth the food passes through the aesophogus into the stomach. In the stomach the food has poured upon it another secretion known as the gastric juice. This juice is made acid by a small amount muriatic acid formed in the stomach. In the gastric secretion are two enzymes, rennin and pepsin. Rennin acts only on the proteid portions of milk (the curd). It coagulates this into a very soft mass. Its action is noticeable in babies who "throw up" their milk. Commercial rennin, which is used in making cheese, is extracted from the stomach of mammals. Pepsin acts upon the proteids of all foods, changing it into peptones, substances which may be absorbed by the body. The mechanical action is produced by the churning process in the stomach, and is an aid both to digestion and absorption.

"From the stomach the food passes into the small intestine where all food capable of digestion, which has not been acted upon in the mouth or stomach, is digested. The pancreatic secretion which is poured into the small intestines is an alkaline solution containing three enzymes, trypsin, amylopsin and lipase. Trypsin changes the remaining proteids of the food into peptones; amylopsin, the remaining starch into glucose, and lipase, together with the bile, which also enters the small intestines, seems to digest the fat. This action is not well understood but experiments on dogs show that if the bile be removed from the animal practically all the fats pass through the body and are thrown off as waste.

"Summed up, we have starches and sugars, by digestion in the mouth and small intestine, changed into glucose which is capable of absorption; proteids digested in the stomach and small intestines by being changed into peptones which are readily absorbed, and fats which are digested in the small intestines.

"Raw starch is digested only very slowly by the human body, although cattle and horses digest it easily. Raw proteid, if it be from the animal, is more easily digested cooked; but is usually cooked to improve the flavor. For cooking proteids, especially meat, after searing the outside to prevent the juice from escaping the meat should be cooked at a low temperature, from 75 degrees to 85 degrees Centigrade, for a long time so that the proteid will be coagulated but not hardened, and connective tissues be softened. In cereals prolonged cooking at a high temperature is desirable.

"Atwater says there are four common errors in food economy: That we buy too expensive food, that we eat too much, that we waste too much and that the wrong food is often selected. This leads us to inquire upon what the value of the food depends. Generally speaking, the food value of a substance is determined by the amount and kind of nutrients it contains, the value of these nutrients, their digestibility, the needs of the body and the cost. The old saying that the best is the cheapest is not true of foods. Eggs have the same food value when they cost twenty cents per dozen that they do when they cost forty cents per dozen. A pound of flour which costs two and one-half cents has the same amount of nutritive value as seven pounds of oysters which cost in the neighborhood of two dollars.

"The intelligent housekeeper must familiarize herself with the needs of the members of her family, with the composition and cost of food and the best methods of preparing each."

THE COOKING OF VEGETABLES.

(Miss Nelle Nesbitt, Assistant in Home Economics.)

Our vegetable foods vary so greatly among themselves in composition and the condition in which we find them, that many methods of cooking must be used to provide the best way for each.

Fresh vegetables, as cabbage, celery and turnips, consist largely of water, often containing as much as 90 per cent, which is a larger proportion than milk contains. The greater part of the solids is the cellulose which forms the structures of the plant. Throughout the vegetable are tiny cells of various forms and functions, but all have walls of this substance cellulose, which we all know in certain forms, as linen, which is cellulose of the stem of the flax plant; cotton, which is cellulose of the cotton plant; and paper, which is made of cellulose from many sources.

This substance, as is well known, has no great food value for the human organism. However, though it is not itself digested by man, at least not to any great degree, in most forms, it allows water and the digestive fluids to pass through it readily. Because of this fact the cell walls except when very thick do not interfere materially with the digestion of the cell contents.

In those vegetables forming the leaves, stems and roots of the plant —as cabbage, celery and beets—are also fibres of cellulose whose function it is to form passageways for food material to the different parts of the plant. These are usually tougher and more resistant than the ordinary cell walls, and the cellulose in the skins is the most resistant of any we have to deal with in cooking. The main functions of the skin cellulose are to hold in the moisture the vegetable contains and to protect it from the action of molds and bacteria. Without the dense coats of skin cellulose potatoes and apples could be kept no longer than some of the more perishable fruits, as strawberries. We turn this property of skins to good account when we cook beets or potatoes without paring them in order to lose none of their nutrient materials. In the beet we can measure roughly the loss of nutrients by the corresponding loss of color, and we know this is least when the skin is unbroken and the leaves cut off a long way from the beet, and, better still, the passages in the stems are allowed to close by drying and shriveling.

Cooking has little or no effect on the cellulose forming the walls of the cells, but there is a modified form of cellulose holding these together which is greatly softened by cooking in boiling water. If we examine a little, well mashed potato under the microscope, we see that very few of the cell walls are broken, but that they have separated from each other because of the softening of the substance which held them together when raw. If we subject a little of the same material to the action of saliva for a few minutes and again examine, we find that no starch remains, showing that even though the cell walls of the potato have not been broken by the cooking, nor even by the mashing after cooking, these walls, seemingly, have not interferred with the digestion of the cell contents so long as the digestive fluids come in contact with the cell. One important object of cooking vegetables, then, is to soften the intercellular substance so that after mastication the contents of each cell may be exposed to the action of the digestive fluids.

The cells contain, besides a large percentage of water, the nutrients, starch, sugar, proteid, fat, and the mineral matter. Of these, starch is the only one made more digestible by cooking. The same high moist heat that softens the cellulose also changes the raw starch into a digestible paste.

The mineral salts are, perhaps, the most important of these nutrients, because vegetables form the greatest source of these salts, which are so essential to the good health and the proper functioning of our body cells and organs. Though never required in large quantities, as compared with the carbohydrates or proteins, life is not possible without them. It has been found by experiments that deprived of the mineral salts and eating other food, and drinking water, man could live only a few days, from twelve to fifteen, perhaps, though, with water alone, and deprived of all other food he can live for from forty to sixty days. One of our greatest cares, then, should be to allow none of these to be wasted, and we can avoid such waste easily with those vegetables having mild and agreeable flavors.

Where the flavor is not objectionable, as in cauliflower, peas, and the tough stalks of celery, which, by the way, are more palatable cooked and creamed than raw, the vegetables should be cooked in as little water as possible and all of it saved to serve in some way, this water contains much of the mineral matters and other soluble nutrients. It may be used as flavoring material for a soup, or as the liquid part of a sauce to serve over the vegetables as peas and asparagus are often served.

In cooking cabbage, onions, or turnips, all of which have strong flavors, much water should be used instead of little, for it is desirous to lose some of the flavor. It will be found that such vegetables will be more delicately flavored when cooked in an uncovered vessel and in much actively boiling water. The disagreeable odors and flavors seem to come from the decomposition of the protein substance in the cells, and that they do not form so readily when the proteid is killed quickly, as is done when plunged into boiling water. The vessel should not be covered, for then the odorous gases given off are reabsorbed by the vegetables, changing the color, taste and digestibility.

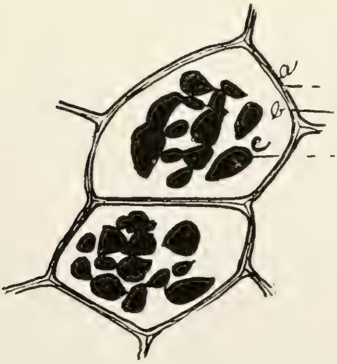


Fig. 1.—Cells of uncooked potato, starch grains stained blue black with iodin.
a.—Cell wall.
b.—Intercellular material.
c.—Starch grain.

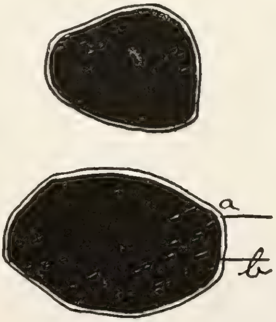


Fig. 2.—Cells of cooked potato, starch paste stained blue-black with iodin.
a.—Cell wall.
b.—Starch paste.

Over-cooking, also, by further decomposition of the protein makes the flavor strong and the color dark. When cabbage or turnips are sent to the table red and strong, we may be sure that one or all of three things have been done: They have been cooked in too little water, have been cooked in a covered vessel or have been cooked for too long a time. In any of these cases the dish is unsightly and is found by most people to be indigestible. Most of the prejudice against boiled cabbage has arisen because the cabbage is rarely well cooked. If the same people who have found it indigestible should be served with some of the same despised vegetable cooked in rapidly boiling water in an uncovered vessel until just tender and no longer, they would probably withdraw the charges they have made against it. Cooked in this way, it contains little nourishment, for the water is thrown away, and with it, such parts of the salts, sugars, etc., as have passed out of the vegetable. It is, however, a good carrier of other nutrients as fats, and gives variety and bulk to the diet.

In preparing old or dried vegetables for the table, all the water lost by the drying must be restored. This is best done by soaking for a long time in cold water, though the process may be hastened somewhat by using warm water. This soaking also removes some of the strong flavors that are often objectionable, as in dried beans. After soaking, these vegetables should be cooked for a long time to soften them and to develop agreeable flavors and texture. The disagreeable raw taste which dried vegetables and cereals have even after being softened, and the starch thoroughly cooked, has never been satisfactorily explained, but, it nevertheless remains a fact that it can be overcome only by long cooking.

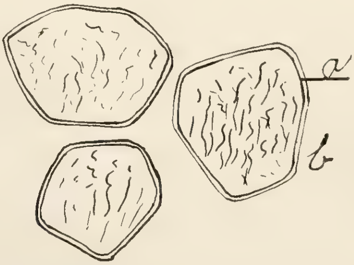


FIG. 3—Cells of cooked and digested potato.
a.—Cell wall.
b.—Cell contents not digestible by saliva.

Potatoes, when in good condition, belong properly among the mild flavored vegetables, but need special treatment because of their composition, as they contain a large amount of both starch and water. A starch paste is formed in the cells in the process of cooking, and the substance holding the cells together is softened by the combined action of heat and moisture. More moisture is present than is needed for these processes, and during the cooking, much of the surplus is converted into steam. This steam should be allowed to escape before it is reabsorbed by the starch or cellulose making the potato solid and soggy. When baked, the skin should be broken as soon as the potato is taken from the oven. When boiled with the skin on, it should be taken from the water as soon as tender, the skin broken, and the potato allowed to become dry and mealy; when pared before boiling, the potatoes should be drained as soon as tender, and should be allowed to dry before being mashed or served. If they must be kept hot for a while, they should be covered with a clean towel or napkin, which absorbs the moisture given off, rather than with the lid of a dish on which the moisture collects in drops to run down into the potatoes.

The reabsorption of moisture by the potato should be prevented in every case, for it is most often this that makes the difference between the white, fluffy, mealy potatoes we like, and the blue, sad looking, disagreeably flavored vegetable that is so often served as potato. There is no other one vegetable that is served as often as are potatoes, for they contain much carbohydrate food, are inexpensive, and should have so mild a flavor that they do not become distasteful with daily eating. However, when placed before us as they so often are, we cannot help protesting against their gross mistreatment.

In summing up, then, we find that we cook vegetables to render them more digestible, by cooking the starch and softening the intercellular substance so that the digestive fluids may have a better chance at the cell contents and to develop or modify flavor. We also find that when not too strong to be palatable, vegetables should be cooked in little water and all the water saved and served, as it contains much of the soluble nutrient material of the vegetable; that in the stronger flavored ones, the nutriment must be sacrificed for the flavor, and the vegetable should be cooked for as short a time as possible in much actively boiling water, giving a more sightly, more palatable and more digestible product than we can otherwise have; that dried vegetables and cereals require long cooking for flavor rather than for digestibility, except for the difference afforded by the psychic influence of palatable over unpalatable food; and that potatoes, by virtue of their composition, should receive special treatment to prevent the reabsorption of water after they are cooked.

PLANNING MEALS.

(Miss Edna D. Day, Head of Department of Home Economics.)

(This talk was illustrated by an exhibit of "standard portions" of many different kinds of foods, and by the combination of standard portions in forming the meals for a day, as indicated by the tables in this article.)

Last year, you remember, I talked about "Well Balanced Meals." This year I want to say a little more on the subject of planning meals from the standpoint of food values. Last year I emphasized especially the *kinds* of food that should be eaten. This year I wish to emphasize especially the *quantities* of the different kinds it takes to supply the needs of the body.

The old method of calculating quantities of food for balanced meals is long and slow and only the very exceptional housekeeper ever attempted to use it. This year, however, there has been published in bulletin form a partial reprint of an article by Professor Irving Fisher of Yale, which gives a much simpler method. Any one interested may obtain this bulletin entitled ''Food Values'' by sending ten cents to the American School of Home Economics, 606 West 69th street, Chicago, Illinois.

As we know, one of the chief functions of food is to supply the body with the energy needed to maintain life and to carry on active work. Since one form of energy is convertible into another, it is common to calculate the energy value of a food by the quantity of heat it will give out when burned. The standard of measure used is the calorie, which is approximately the amount of heat required to raise the temperature of one pound of water 40° F.

By the method of Fisher, the quantity of food necessary to yield 100 calories of heat to the body is taken as a ''standard portion.'' It works out very conveniently in the case of many of our common foods that an ordinary serving forms a 100 calorie portion. Thus as given in the bulletin:

Beef, round, boiled (fat), a small serving	(1.3 oz.)	yields	100	calories
Beef, round, boiled (lean), a large serving	(2.2 oz.)	"	100	"
Lamb chops, boiled, one small chop	(.96 oz.)	"	100	"
Eggs, hens', boiled, one large egg	(2.1 oz.)	"	100	"
Shredded wheat, one biscuit	(.94 oz.)	"	100	"
Bread, white, home-made, one ordinary thick slice	(1.3 oz.)	"	100	"
Butter, one ordinary pat	(.44 oz.)	"	100	"
Corn, sweet, cooked, one side dish	(3.5 oz.)	"	100	"
Peas, green, cooked, one serving	(3. oz.)	"	100	"
Potatoes, baked, one good sized	(3.05 oz.)	"	100	"
Apple sauce, one serving	(3.9 oz.)	"	100	"
Spinach, cooked, two servings	(6.1 oz.)	"	100	"
Strawberries, two servings	(9.1 oz.)	"	100	"

Some other interesting food values are as follows:

5 olives	yield	100	calories.
3 chocolate creams	"	100	"
7 large dill pickles	"	100	"
2 graham crackers	"	100	"
1 oz. raisins	"	100	"
1 quart clear meat soup	"	100	"

We need, daily, between twenty and thirty of these standard portions, the number depending on our work, age, size, etc. (The bulletin gives details on this subject also.)

Our problem would be very easy if each 100 calorie portion equaled every other in all respects, but, as we know, the body needs food to build up and to repair its waste tissue as well as to furnish it with energy. Mineral salts furnish no appreciable quantity of energy, but they are very necessary as building material, so care must be taken that our foods are not deficient in these salts. Proteins build the body as well as furnish energy, and authorities say that from 10 to 14 per cent of the calories of energy taken in our food should come from protein. They also say that from 50 to 60 per cent of the calories should come from carbohydrates. The bulletin tells what per cent of the food value of each food is protein, what per cent fat, and what carbohydrate.

To illustrate the use of the method we have selected from the portions given 24 for a day's meals.

MEALS FOR ONE DAY CALCULATED ON THE 100 CALORIE PORTION BASIS.

Name of food.	Quantity.	Oz.	Calories of Protein.	Calories of Fat.	Calories of Carbohydrates	No. of 100 calories portions
BREAKFAST.						
Apple (raw)	1 apple	3.65	1.5	3.5	45.	½
Oatmeal (cooked)	1 ordinary serving	2.8	9.	3.5	37.5	½
Cream	¼ ordinary glass full	1.7	5.	86.	9.	1
Sugar	3 teaspoons full	.86	0.	0.	100.	1
(Coffee)						
Toast	2 large slices	2.6	26.	12.	162.	2
Butter	1 ordinary pat	.44	.5	99.5	0.	1
Bacon (cooked)	1 thin slice	.13	1.5	23.5	0.	¼
Potato (cooked)	½ ordinary size potato	1.5	5.5	.5	44.	½
Totals			49.0	228.5	397.5	6¾
DINNER.						
Soup (cream of celery)	1 ordinary serving	3.15	8.0	23.5	18.5	½
Potato (mashed and crd).	2 small servings	6.28	20.0	50.0	130.0	2
Peas (canned, cooked)	1 side dish	3.15	12.5	1.5	36.0	½
Chicken (cooked)	1 ordinary serving	3.15	79.0	21.0	0.0	1
Bread (white, home-md)	2 ordinary thick slices	2.6	26.0	12.0	162.0	2
Butter	1 ordinary pat	.44	.5	99.5	0.0	1
Apple tapioca pudding	1 ordinary serving	2.80	1.0	1.0	98.	1
Totals			147.0	208.5	444.5	8
SUPPER.						
Macaroni with	1 large serving	9.70	28.0	30.0	142.0	2
Cheese (cooked)		3.85	12.5	36.5	1.0	½
Cabbage (raw, cold slaw)		2.75	5.0	2.0	18.0	¼
Bread (white, home md.)	2 ordinary thick slices	2.60	26.0	12.	162.0	2
Butter	1 ordinary pat	.44	.5	99.5	0.0	1
Milk (rich, whole)	1 small glass full	4.90	19.0	52.0	29.0	1
Apricots (cooked)	1 large serving	4.61	6.0	0.0	94.0	1
Cake (sponge)	1 large piece	1.33	10.5	37.5	102.0	1½
Totals			107.5	269.5	548.0	9¼
Totals for day			303.5	706.5	1390.0	24
			(12½%)	(29%)	(57½%)	

Of course I do not suppose that any one would be satisfied with every part of these meals. Our food tastes differ too much for that. They are not meant as model meals, but are shown simply to illustrate the method. They are, of course, capable of very many modifications. The chief point to notice is that, as shown by the last column, we are able to use the standard portions or simple multiples or simple fractions of them. In only two cases it will be noticed have less than ½ of the portions been used and in no case more than double portions; though, of course, it is possible that a person might eat three instead of two slices of bread in a meal! The second column of the table gives the quantities as they appear to the eye. As, however, "an ordinary serving" is a rather indefinite term, the next column, giving the weights of the portions in ounces, has been added. The 4th, 5th, and 6th columns tell of the source of the 50 or 100 or 200 calories. For instance, an apple weighing 3.65 ounces will yield ½ of 100 calories of heat, or 50 calories. Of these 50, 1.5 calories came from the protein of the apple, 3.5 from the fat, and the remainder, or 45.0 calories came from the carbohydrates. So with the cream: 1.7 oz. of cream makes about ¼ of an ordinary glass full, and yields 100 calories of heat. Of these 100 calories, 5 came from the protein of the cream, 86 from the fat and 9 from the carbohydrate, milk-sugar in this case.

By adding up the columns it is easy to get the food value of the meals. The breakfast yields 6¾ hundred calorie portions, the dinner 8 and the supper 9¼ standard portions, giving a total for the day of 24 portions. Few persons would be satisfied with just this distribution. Many would make the breakfast and noon meals lighter and have more at night when the day's work is over; and others would prefer to begin their day with a heavier meal, have more at noon and eat but little before an early bed time. Of course such readjustments could easily be made.

Care has been taken in selecting these 100 calorie portions, that between 10 and 14 per cent of the calories should come from proteins, between 50 and 60 per cent from carbohydrates and about 30 per cent from fats.

Also, care has been taken to follow other principles, given last year, and to include foods rich in mineral salts, such as oat meal, potatoes, peas, cabbage, and milk; foods rich in cellulose, such as oatmeal, apple, peas, cabbage, and apricots; and foods yielding organic acids, such as apples and apricots.

Also, the more expensive "flavor foods" have been combined with the cheaper "filling" foods, as bacon and potato, butter and bread, chicken and potato, apple and tapioca, cheese and macaroni.

It is especially recommended to those who could not attend the Conference and see these portions of food weighed out, that they at home try weighing out and setting side by side some of the standard portions here given. Nothing will help more quickly to give an idea of total food values.

THE BOY AND GIRL ON THE FARM.

(Mrs. N. H. Gentry, President of the Homemakers' Conference, Sedalia, Missouri.)

A pen that was never gifted and has lain idle for thirty-five years can not do much in the way of writing an interesting paper to be read before an intelligent motherhood. The hands and head that have had the care and worry of a large family find it difficult to write an article for the press. If there is one thing more difficult to do than another it is to tell the best way to raise the boy and girl. I, who have spent the greater part of my life on the farm, consider the farm the ideal place to rear both the boy and the girl. The sweetness of the air, the quietness that brings repose, the sunshine with it's health-healing properties, the birds that make the music, the nuts that gladden us in autumn all go to make a stronger body, a brighter mind and a purer conscience. Care only for the health and strength of the child is all that is necessary in the first few years. The clothing and food should be such as to conduce to the child's health. The doing and saying of funny things should not be encouraged in children nor should the same be repeated in their hearing. Fresh air, plenty of plain food and clothing, a good bath every day will do all that is of any account for the first few years. From the cradle the child should be taught to obey. Obedience to father and mother, then teacher and nature's laws, and later spiritual laws.

Early in life the child should be taught to tell the truth and an untruth should never be told to them. They should also be taught the life of the Christ child in an easy, simple style that can be understood, and while the body grows character will grow also; for what is more beautiful or more to be loved than a strong, healthy, obedient, truthful child. At the tender age of six years our law has decreed the child shall go to school, and education properly begins. With the education of the mind, the soul, heart and body should also be educated. Every exercise that will develop physically should be practiced, and as much of out-door life given as possible. Give your daughters the same chance to develop physically as your sons. A family having several children on the farm can have a teacher in the home with very little more expense than sending to the public school, and many ills avoided; such as the diseases that so frequently break out, and, worse still, the learning of evil that so often belongs to the little red school house on the hill. At home you can watch over the lives of young children more closely and have healthier children and a better education, thereby requiring fewer years to be prepared for entering high school or college. To make the boy or girl happy and contented in home life they must have music or art or whatever pleasure their tastes require. One of the greatest factors for good in the home is to cultivate in the child a love for good books, thus enabling them to entertain themselves while alone. Friends and companions should be welcomed when out of school hours, enabling the mother and father to know who their associates are, and to choose for them in their youth, thus rendering them competent to select later in life friends who will prove a benefit and a blessing.

The education of our children must be a life work. In our home the school and music were the principal work of the day, nothing was allowed to interfere but sickness. Everything was carried on as in a large, well disciplined school. We also had the Bible taught and read as a text book, thereby gaining knowledge which, if not acquired when young, is apt to be neglected later in life when other things crowd in. In our home in winter we had our Sunday school, reading the Word of God, reciting the Lord's Prayer in unison, singing, with one of the girls at the piano, and taking of the collection. The pennies were saved and sent to the Orphan's Home in St. Louis, enough having been given in two years to buy a foot of ground for the Orphan's Home.

Such practices teach the child in youth to be generous in giving and to have regard for others. Our children each had home duties, and work they were required to do daily. It is a serious question in the minds of many whether it is best to pay the child a small sum of money to stimulate to perform better work.

In our home the children were paid, the money being put away in a little bank, and once a year, at Christmas time, they opened the bank and Christmas shopping was done, remembering each other, as well as their friends. The value of such a fund none but a child can know.

Parents owe it to their children to teach them to perform the daily duties of home life, waiting on others rather than being waited on, thereby developing in them the ability to share in the responsibilities of a home. Love your children and tell them of your love often, sympathize with them in sickness as well as in their troubles, both imaginary and real, but not to the extent of making them believe they are too delicate or too much petted to perform their part of the daily burden. The wishes of small children should not be considered where their welfare is concerned. I used to tell my children if they knew best they had no need of father or mother. The home should be made pleasant, and if there is education and work going hand in hand, with out-door sport and in-door attractions, their lives will be made both pleasant and profitable. Children require regular work in order to more fully enjoy themselves at play. The mixture of the two render children happier and healthier and better prepared to win in the battles of life. I certainly believe in higher education. If possible, give both our daughters and sons college educations, so necessary to success later in life. We should feel encouraged to do so because from the farm have come most of our statesmen, and presidents as well as most successful men in all lines of work. It has truly been said that agriculture is the foundation of our nation's greatness. Without the farm there could be no city; for statesmen have said that if our farms were deserted the streets of our cities would grow over with grass.

The most valuable productions of our farms are our sons and daughters. Their characters are stronger, their energies more enduring, their chances for success in this life, for salvation in the life to come are greater for having known the farm.

RECREATION IN THE RURAL COMMUNITY.

(Miss Alice Kinney, New Franklin, Mo.)

The subject of Recreation seems most timely at this season when every heart should have laid aside its cares and made merry with the abandoned spirit of our childhood days.

Americans, as a nation, seldom relax from their strenuous daily routine, so we must turn to other lands for a leader; and from Germany, with her many festive holidays, we get our best object lessons.

Some one has aptly said that the children are the nation's best asset, and while we are busying ourselves on the ways and means to conserve our forest and waterways, we should not forget the child, the most important factor of all.

Perhaps there has been no subject in the minds of the people more prominent during the last few years than the playground. At first the newspapers treated it as a sentimental fad, others thought a workground for children would be of far greater benefit—for the public has been slow to realize that adequate facilities for recreation were as necessary to the peace and to the high development of society as the opportunity to earn living wages.

The normal growth of the child is through specific forms of activity, which are embodied in certain plays and games. You have often heard that "a boy without a playground is father to the man without a job," for it is nature's method of making a man, and play is a necessity to a child and not a mere luxury. Even the cities have been slow to grasp the deep importance of the playground movement. Today, however, most, if not all, large cities are providing means for one or more playgrounds, thus realizing from its demonstrated success that "healthy and happy play saves from idleness, vice and crime. Children denied the opportunity to work off their animal spirits in wholesome exercise will pervert those spirits into mischievous use. Most juvenile crimes are said to originate in the congested parts of the cities, and the playground instructor secures his influence because he knows more things which will hold and interest the children than their natural street leader. It has been found that the best results come from proper supervision rather than permitting the children to look out for themselves.

"Play is nature's short cut to experience," for while under a director the child is left free to choose the games he will play, for children's sports should be freely developed for the sake of the child, and not the spectators. The wholesome lessons which fit the child for the future true citizen are those learned on the playground. Playground directors often find at first many of the children knowing nothing of play's delight; therefore, teasing, interruptions, rude blows and fights are frequent—bad language also invades the playground; but the children are soon taught that the rights of others must be observed, and by denying them a part in the games as a punishment for disobedience, they are soon brought to terms. Here they are taught to play fairly, take no advantage, be courteous, but to play hard and win if you can. These lessons are for the child now and the coming man later.

Fully believing that to "Every child equal opportunities, not the fortunate few, but all the children," I ask if playgrounds have proved so practical in the cities, why the children of our inland homes cannot have the same privilege? We have plenty of broad acres, with children just as eager for play and just as appreciative of ways and means provided. The answer has always been the same—"the country child has enough exercise at home and in his walk to and from school, with fresh air upon all sides." But is this play? Stop and think of the many duties and chores that fall to their little hands and feet before and after school! These are proper and good in their place, but they utterly fail to supply to that boy or girl what they crave in companionship or in stimulating the activities of brain and body.

The cost of necessary facilities seem a great drawback, and many town schools gave up the idea of a playground on this score. But in our little town of New Franklin, the mothers and teachers put their heads and hearts together and planned a beginning, which is slowly evolving, and, while still in its infancy, it is giving the greatest amount of enjoyment to our children, who previously had no amusement save to stand and watch the larger girls play basket ball. We talked playground upon all sides, and gradually help is coming—money from one lady; lumber from a gentleman for various amusements; from another sand for the little ones, for hard is the heart that will refuse help for the needs of a child. What has been done in one community can be done in another, though in varied ways, and I want to pass on to others the inspiration of our success. It is to the mothers that I make my special appeal. Some one has so beautifully said, ''Home is held together by the silken cord of love, and in most cases the mother ties the knot;'' and so it is the mother who will help solve this problem. Perhaps she cannot do much alone, but there are other mothers who will share in her efforts, and a most grateful teacher stands ready to give her service as a leader in their plays. Some farm has an old discarded wagon wheel, and in the near-by woods are plenty of strong timber from which the larger boys can fashion a post for the wheel, ''Flying Dutchman,'' juggling board and double see-saws. Their happiness will be your rich reward. These same facilities at your own home would help to hold the young boy and girl on the farm.

The efforts put forth for the child will be your recreation. More than this, you will have learned to know the mothers of your children's daily companions. You will have found in your teacher a most pleasing young woman who has been left to struggle alone with the varied conditions of each rural school, when even an appreciative word or a helping hand would mean so much to her and her work for your child. You will have learned how happy and proud your child was to have you visit the school. You will have learned that the co-operation of mothers and teachers can make a success of a playground and the school when possibly failure has been its past history—with the drawback of a new teacher each year.

School playgrounds mean much more than merely a place for play. The school thus becomes a community center for the physical, social and moral uplift of the community and not merely a building to be used a few months, and lie idle the rest of the year.

THE RURAL HOME.

(Dean F. B. Mumford, College of Agriculture.)

It is generally recognized that the open country offers advantages for healthful living and the development of sterling qualities of mind and heart not found in the congested portions of our modern cities. There is an increasingly large number of thoughtful people who believe that the tendency from the country to the city is even now being checked and a counter-movement from the city to the farm has begun.

In recognizing the favorable environment of the open country for the location of a home, we must in fairness, take cognizance of certain disadvantages which present themselves forcibly to the country man and his family. Chief among the disadvantages of country life is the lack of satisfactory organization of the social institutions of the country. Among the social institutions of the country are the school, the church, and various farmers' organizations that are calculated to administer to the social, intellectual or economic welfare of the farming class.

The rural school does not furnish to the children of country people the same opportunity to secure a good education as is presented even by the smaller towns. The fact is that the children of the poor in towns and cities have a far better opportunity of securing a modern education than the children of the rich who live in the open country. The result of this disparity of school opportunity has led many farmers' families, who are financially able to move to the town, to secure better educational opportunity for their children. This not only drains the country of the most progressive part of its people, but it removes the chief incentive for building up the local school. The well-to-do man is able to send his children to town, even if he does not himself, change his habitation. He is not, therefore, impressed with the necessity of building up the country school. To the poor boy or girl in the country this is a great misfortune.

The country church has declined in every agricultural section of the United States. The country church was the cradle of our modern religious institutions. No one of our social institutions can point to greater service to country people than the country church of our pioneer days. It must be admitted by any fair-minded student of rural social conditions that the country church of today does not occupy the same important space in our developing civilization as formerly.

A great many of our most thoughtful statesmen and industrial leaders have expressed publicly the idea that the economic affairs of the future will be shifted more and more from city to country. They also admit that the best opportunity for the highest development of the social life of the future will be in the open country. How can these things be when the two most important social institutions of the country, the school and the church, are failing so signally to fulfill the important mission which they must fulfill if the future life of the country people is to occupy so important a place in our political, intellectual and social economy?

In my judgment it is important that we all work together for the building up of the rural social institutions. The man who lives on the farm is the chief factor in this development. It is to him that we must demonstrate the value of the better organization and development of the church and the school. With these must go hand in hand the farmers' organizations, including co-operative enterprises of all kinds. The reason why towns have better schools, churches, lights, streets and water supply, is because the town has worked out more carefully practical methods of co-operation. It will be far more difficult for the country to co-operate because the rural problem is one of isolation, while the city problem is one of congestion, but nevertheless, there remains a large opportunity for co-operative enterprise.

THE RELATION OF THE RURAL SCHOOL TO THE RURAL HOME.

(Mrs. H. C. Harvey, Kirksville, Mo.)

The Home Makers' Conference Association of Missouri has selected me to speak to you tonight about the relation of the rural school and the rural home partly, I suspect, because of my insistence before that body a year ago that there is a vital relation between country life (the home), and the country school, as yet not generally recognized, and partly because of my strong convictions that there is a feasible plan by which the country schools can more adequately prepare children for country living.

Country born and bred, later a teacher in the rural district—and for six years both directly and indirectly connected with a school that receives hundreds of young men and women from the farms of Missouri, I have had exceptional opportunity to understand general conditions and problems; since October 20, this year, I have conferred with fully 500 rural teachers, directors and patrons with this effect upon myself—I am so deeply interested in the question before us that I presume to stand before this audience far less concerned about representing the Homemakers' Association to their satisfaction, than I am about how well I shall present the cause of 62½ per cent. of Missouri's youth, her country children, who so far as educational facilities are concerned, are not enjoying *equality of opportunity under the law* with the 37½ per cent. residing in town centers.

Childhood is the preparatory stage of life—it is all too brief—it comes but once. The children of today are the citizens of tomorrow, and I can think of no more pathetic thing than to hear man or woman cry out, from the despair of knowledge that comes too late, this sad commentary on the failures of parents and teachers, "It might have been—success—if only I had had timely opportunity and direction."

It augurs well for the future of Missouri that at this great meeting of twelve organizations for the advancement of the agricultural resources of this rich State, so much time is set apart for the consideration of the problems of the country home and the country school. It is hoped that this discussion will result in increased activity and a closer co-operation of the State's economic, social and educational forces to the end that the evolution of the country child from the deadening monotony of the isolated home, too often without books, pictures and music; from the dirty bare school and its daily grind of hum-drum lessons from the text-book, from the mud, the dreariness, the hopelessness of it all—may come early and stop the steady flow of the State's best blood to the cities and towns with all its accompanying ills.

Because we who are here tonight are deeply interested in aiding any movement that promises to better country life conditions, and keep the majority of the boys and girls on the farm, it becomes necessary first to examine closely these conditions and then consider remedial measures.

And do you know it requires a great degree of moral courage to view unpleasant truths squarely? Yet this persistent refusal on the part of so many to recognize painful facts is one of the greatest obstacles to progress in any line of human endeavor; another obstacle, equally strong is tradition or custom, as I hope to show you later on.

As an incentive to a thoughtful consideration of what follows, I quote what Judge Ben Lindsey once said: "The child is the State and the State is the child. Preserve the child, and indeed you shall preserve the State; for the citizenship of tomorrow will then take care of itself."

A good citizenship is the most valuable asset a State can claim, keeping it stable in time of stress, more valuable than stocks or bonds, farms or crops even; whereas without it, we would be unhappy in wealth. While it must be admitted we have good citizens in urban communities, it is also granted that the cities themselves would decay were it not for the constant stream of virile country blood they receive—and history shows that always the intelligent, honest, industrious tiller of the soil has been the hope of the nation; in our country, as a rule, the leaders of men in all walks of life came from the farm home.

An acknowledged modern authority contends in substance that the prime causes leading to the fall of Rome were: "Dislike of patient toil, hope of quick profits, extravagant desires, the creation of pleasure-loving appetites, resulting in the abandonment of agriculture, the rush to cities, the hatred of loneliness and nature, and the proclivities for street life and sensation."

If the overcrowding of town centers and the abandonment of agriculture preceded the downfall of Rome, is it not timely to give thoughtful examination into the causes of this movement in our own nation?

Ex-President Roosevelt thought so when he appointed that group of scientific men—The Country Life Commission—to study the economic, social and educational conditions on the 840,000,000 acres of land now devoted to farming, and raised this question: "How can the life of the farm family be less solitary, fuller of opportunity, freer from drudgery, more comfortable, happier and more attractive? How can life on the farm be kept on the highest level, and when it is not already on that level, be so improved, dignified and brightened as to awaken and keep alive the pride and loyalty of the farmer's boys and girls, or the farmer's wife and the farmer himself? How can the desire to live on the farm be aroused in the children who are born on the farm?" The first sentence sounds the keynote to the situation where it says "less solitary, fuller of opportunity, freer from drudgery, more comfortable, happier and more attractive," and it implies some failures on the part of home and school, else why this wholesale depopulation of rural districts?

The home is the unit of American civilization, and the school may be the best or the worst influence that may come to the home, and should always be regarded as an auxiliary of the home. The best culture of the school will aid in making the ideal home, and the ideal home is constantly busy in planning and providing for the best possible type of school. Let me show you a rural school in North Missouri that I have viewed so many times from the Wabash train the past six years; a school within the shadows of a model rural school house, where patrons, directors and teachers must have heard of the State Superintendent's repeated appeals for annual tree plantings, cleaning-up days, etc. This school building has weathered such influences successfully, and there it stands today unchanged except by the wear of Time and continued neglect. It is the box-car type of building, with the usual outbuildings, in themselves a menace to the moral health of the children. It stands in a yard bleak and bare—a type so universal that the traveler from any section of the United States of America, in passing, would point it out as—"a typical rural school." That house as you see it is a monument to the ignorance of parents and teachers of the potent influence that physical surroundings exert on the lives of children therein housed; ignorance of the effects of physical environment on the quality of citizenship this school turns out.

In the interior of this house is a big red stove standing in the middle of the room, makes even heating impossible; four windows on each side of the building, placed opposite each other, cause strong cross lights, ruinous to the eyes, the seats and desks are of the kind in use forty years ago and are placed without regard to the needs of growing children. There is no library, no maps nor globe, no pictures on the wall. Yet in this same section, I have noticed a steady improvement in the farm conditions, in fences and gates, in the variety and grade of stock, in the number of good barns that stand out for miles as an index to the progress and prosperity of the farmers—barns that appear in strange contrast to that lonely building, where those farmers' children are expected to receive their education—an education, think you, that will adequately equip those helpless children for successful competition in the struggle for existence and advancement under twentieth century conditions?

Lest you charge me with presenting exceptional conditions to be found in North Missouri only, I must tell you that in historical Pike, the county of our own Champ Clark, I listened with increasing surprise to the reports of six county school teachers as they successively detailed the obstacles to proper work in their respective districts. For lack of time, I mention but one, and that of great importance, failure to provide a supply of pure drinking water on the school grounds. Aside from considerations of hygiene, and economy of school time, the methods necessarily resorted to to supply this primitive want of man characterized the days of Daniel Boone, without bringing the advantages that he enjoyed. A county superintendent in another county within street car distance of St. Louis, confessed in his association not long since there were schools in his county where the district neglected to provide a water supply. In one case a spring more than a half mile away was depended upon. To save as much loss of time as possible for the children, a watch was kept for the good neighbor who would be passing and who might find time to take the empty school jug with him and return it filled with the limpid fluid.

In another county I found a good school, well equipped, with a teacher who *knew* better than she *dared to do;* her predecessor having lost her position for demanding too many changes. She allowed those helpless boys and girls to sit and study in the strong glare of a cross light, because her superior officers said they saw "no sense" in changing the furniture's position, which change would have remedied the difficulty in that room. These few of many similar instances are cited to show the relation of home and school. The stream cannot rise higher than its source, and is is self-evident that homes maintaining modern standards of living would promptly demand from Board and teacher, a clean, attractive, well-equipped school room, comfortably heated, properly lighted and ventilated, with plenty of pure water to drink, a working library (for the law provides for this today), and outbuildings as carefully inspected as the school room.

Why? Because six hours a day, five days of each week, for from six to nine months, is spent here, during that time of life when environment is a dominant factor in education.

Such conditions as just described point to a deplorable apathy of public sentiment concerning rural schools; show they are not keeping pace with general progress, and a moment's reflection will also show how potent the influence of such schools is in driving boys and girls of spirit, ability and ambition to the town centers; for children are gregarious animals and the gayety, the glitter, the social life of the city allures them too often to their own undoing; certainly to the hurt of the cause of more small farms and intensive farming.

Now I wish I could throw on a screen before you some pictures I have of another type of one-room school, pictures showing groups of happy busy boys and girls doing the various kinds of hand work there undertaken, and pictures of the products of their activity. Here the people of the district have selected directors to serve the best interests of the children by employing the best teacher available for the money at their command, have equipped the school as best they could, and have granted the teacher full liberty for the conduct of her work.

This building has a well-drained basement with a concrete floor and furnace. In bad weather, the children spend the recesses here in play or work as they choose. There is a work bench in one corner made by the boys and fitted up with a few tools that have been loaned (saw, hammer, plane, square, and chisel). Another corner is arranged for the elementary agriculture, soils and plants being studied here without littering up the class room. There is a school garden on the grounds for the study of vegetables and flowers in season; vines have been planted by the pupils to cover the outbuildings which together with shade trees beautify the premises. The girls of this school learn plain sewing, darning, embroidering and this handwork being intelligently directed serves not only as a stimulus to the book-work, but *gives an edu-*

cation for efficiency that deepens the interest of boys and girls in home duties and in improving home surroundings.

In another country school where the teacher won the confidence of her community by successfully teaching the "three R's," a weekly cooking class was arranged. On Friday of each week pupils brought materials and utensils from home and cooked (according to a recipe previously agreed upon) on the top of the great drum of the well known Round Oak stove. Boys and girls were equally interested in this, just as both were interested in the agriculture and manual training work in the other school.

Certainly this work was not done so scientifically as it would be done in the laboratories of your University here but its inspirational value can never be measured.

It is interesting to note that three girl graduates in the county class the first year were members of this cooking class, and also, contestants and prize winners in a sewing contest of that county.

So contagious was the example of this school, seven prize winners came from schools the next year taught by men who called on the County Superintendent for instruction to carry on the work so popularly demanded.

Mothers visited the office of the County Superintendent for more instruction to help their daughters at home, one confessing she had tried hard to teach "Mary" to sew but she never cared about it until the other girls at school took it up, then Mary became a prize winner. You see the "group influence," what others can do even the indifferent become interested in doing. This work stimulated interest in the regular routine of school work, and here we see how the school reaches across and influences the home.

Ladies and gentlemen, I would have you notice that outside of books, outside of class rooms come most of the interests that are chiefly active in directing the choice of the individual; and it is because I know so well the splendid possibilities of country life yet scarcely dreamed of in so many rural communities, because I know, too, the struggles, the hardships, and the failures awaiting the majority who drift to the cities, that I so frankly suggest prevalent conditions, and plead for your influence as individuals, and as a body to organize the country schools so as to help to accomplish the great purpose of keeping boys and girls on the farms of Missouri.

Farm homes of pretentious architecture fitted with modern equipment of heating, ventilating and plumbing are common today, though by no means the type. The farmer has the telephone in his house, the daily delivery of mail, carriages or automobiles for transportation.

His grain and livestock are housed in barns of modern design admirably adapted to the purposes for which built, the latest and best farm implements and machinery to minimize labor; but with comparatively few exceptions the country school is but little changed from those of our grandfather's days.

Hear what one of your most active members wrote me; "I am a Missourian and my parents were both born in Missouri, so that I am a native for two generations, and I know that our people in the rural districts have not yet been brought to the point when they will give their children the educational advantages that is their due. My first experience was in a country school, and I do not doubt for a minute that the very building in which I started to school about thirty years ago is either still standing or has been replaced by one exactly like it —and that is in one of the best counties in North East Missouri. Our farmers must not only be willing to put more money in the schools, but they must be willing to put in a whole lot more money than heretofore. Most of the work towards improvement that has been done heretofore has been through the teachers, but I do not believe that any teacher on earth can bring about permanent improvement until the cooperation of the patrons of the school is secured. Teachers can start the work, but teachers change, and permanent good can come only when the parents themselves are interested." This is the burden of sentiment obtained from thoughtful and patriotic men and women from all parts of the state.

Mr. Roosevelt's question implies among other things, that the country school has not kept pace with the city school; that the good teacher has gone to the city; that the good scholar has followed him there, too, often taking with him the family, never to return, all of which operates to sap the vitality of the country school not only as to attendance, but as to personal interest and financial support as well.

Thoughtful people everywhere are coming to recognize the equal rights of the country child in the matter of education, and this, too, without breaking up the family home, and that anything short of this is unfair to the child and unprofitable to the community.

Available statistics down to 1904 show an appalling situation: In Michigan of the 6,452 districts of the state, 51 had two pupils or fewer and held no schools; 83 schools in the southern peninsula enrolled five pupils or fewer, that over 1,000 country schools in Michigan are maintained at a cost per pupil more than double that of the most expensive city schools. Iowa's 1909 report shows that in December, 1908, 3,244 rural schools had a daily attendance of from *one* to *twenty.*

The Missouri report for 1902 shows more than one fourth of all the schools have fewer than twenty—that 575 have fewer than twelve pupils. Without having had time to procure the figures of later date, I am absolutely certain a revision of figures would show a far stronger tendency downward than does our new tariff bill. And the significant thing is, similar conditions are found in the majority of the states of the Union, today.

What has been done in so many places elsewhere to remedy this and equalize educational opportunity for all classes of children?

The consolidation of country schools into larger and stronger teaching units is the happy solution in many places in more than twenty states at this time.

What is consolidation? The uniting of two, three or more small and weak schools into one, that shall be large enough in point of members to be interesting, and strong enough in the way of money to afford a comfortable building, two or more good teachers, and reasonable facilities for work. It also means that outlying territory with but few children shall be combined with a nearby school that is strong, rather than be organized as an independent but weak district. These schools should be located so as to be accessable, though not necessarily at the geographic center.

Consolidation implies either in full or in part the transportation of a portion of the pupils, and this is one of the problems. This is frequently accomplished in covered wagons, artificially warmed, holding fifteen to twenty children, driven by reliable men under contract and bonds as to regularity and good behavior. It has been proven that it is cheaper to transport a few children than to establish a school for them.

Consolidation also means, where small districts already exist, some changes in buildings. Two or more of the little old buildings are moved together, or one is remodeled with an addition built, thus making a two or three room house; again, new buildings are erected. All ways are open. The makeshift is to be recommended until the plan is in full operation, when a good permanent building is almost certain to follow in time.

Hon. W. M. Hayes, Assistant Secretary of Agriculture, Washington, D. C., said this recently:

"It has been shown that the rural school needs to be born over into a new life which will fit it for its part—a most important part in the evolution of modern agriculture and modern country home making. The one-room school must become the four-room consolidated school, so that a man trained to teach agriculture and a woman trained to teach home economics may here find that fair wage and that long tenure of office which will warrant them in thoroughly preparing for their important tasks. The faculty of four or five teachers can conduct a ten-year course extending through the eight primary school years and two years of the high school for the 150 children from as many farms in an area of twenty-five square miles. The cottage of the principal; the plantations of timber, fruit, vegetable and ornamental plants; the plats for field crops; fertilizer demonstrations, and farm-management lessons; the laboratory and practice rooms and the vital connection the teachers can have by co-operating with parents in the work on the farms and in the homes will ground the children in the elements of a true education in country life. With the schools thus organized there is provided in the country a far broader child life than has yet been conceived for city youth. How can the nation better expend some of its wealth than by thus making provision for well-nigh ideal conditions of fatherhood and motherhood in our country homes? Two hundred of the needed 40,000 consolidated rural schools have been established, and practical studies in agriculture and home economics are slowly but surely finding their place in them.'' This is ''Uncle Sam's'' ideal country school.

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Many examples of good centralized schools in Ohio, Massachusetts, Iowa, Idaho, Indiana, Kansas, etc., could be cited to show how general is this movement, but those offered demonstrate the ideal, and the feasibility of the plan for Missouri. Indiana has the leadership here with many splendid township high schools and with prophetic emphasis upon the things which will help country life. Statistics of 1906 give 9,424 children transported in 561 vans, 301 *consolidated schools*, at a cost per day for transportation of $1,034.04. A movement is now on foot to secure legislation to compel the closure of all schools with an attendance of fifteen or fewer, the trustees to be compelled also to furnish transportation of all children, to centralized schools.

Rural school conditions will remain as they are until the farmers themselves insist on the establishment of a rational system of schooling for country children, a system that may operate without breaking up the family, or endangering the morals of children at tender ages. And this, I firmly believe, they would be only too willing to do, if only the campaign of publicity undertaken by the Agricultural College would be taken up by all the educational forces of the state and waged intelligently and tactfully.

Our pressing need is a system of country elementary and secondary schools suited to the needs of the people in which both *agriculture and home economics* shall be freely taught.

I am strongly opposed to the growing sentiment in favor of the articulation of rural schools with the town and village schools, and for the same reasons, which must be apparent, do I object to towns of any size becoming seats of the consolidated district.

There is not time to marshal before you the many arguments in favor of consolidation. It seemed best to attract your attention to prevalent conditions, feeling certain when you have taken time to consider Missouri's high rank in wealth and importance and her low rank in literacy, you will voluntarily investigate the merits of measures recommended for bettering rural school conditions. I urge everyone present to secure a copy of the Report of the State Superintendent to the 45th General Assembly and read the opening chapter, a startling array of facts telling *the story of unequal school privileges* that exist in this state today, and his recommendations. Then read the December, 1908, Bulletin issued by the State Normal School at Kirksville on the "Consolidation of School Districts." This gives a digest of the subject showing the *advantages* and *great economy* of the plan and describing different types of centralized districts, also suggesting *how to organize them.* If these two chapters could circulate in every school district in the 114 counties in the state before next April, I believe sentiment would be aroused certain to express itself in a wiser use of the opportunity offered to the *annual school election* and the voters of this State would see to it that legislation for a more effective system of popular education would receive the best thought of their representatives in the next General Assembly.

State Superintendent Gass is not certain but that consolidation of schools is our next paramount issue: Dean Davenport at Urbana, Ill., says: "It is coming. It is only a question of time and not a very long time either. Consolidation is but a means to an end, and the end is an adequate system of schools for farmers' children."

Consolidation of school districts, indeed any new thing, is viewed with suspicion, if not bitterly opposed because not understood, and the advocate must be prepared to meet these two principal objections:

(a) It costs too much.

(b) Roads are not suitable for transportation. The Bulletin referred to will give facts and figures about the different degrees and different kinds of consolidation, showing that *good schools with less outlay,* or *better schools with the same outlay,* is the general verdict.

The problem of transportation has an important bearing on the advancement of the idea of the centralized school. Roads will improve, in Missouri, thanks to Ward King's simple inexpensive drag system of

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NOTE—The Nature Study Review, December, 1908, Teachers' College, New York. Second Report on Industrial Education in Rural Schools, Irwin Shepard, Winona, Minn.

making good *dirt* roads and the increasing popularity of the automobile with farmers.

In this question of bad roads is involved other traffic: mail and milk are being delivered under present conditions, then why not children, also? "Hesitancy on this account not only deprives children of school privileges, but also shirks upon them, and their feet and legs a job considered too hard for the horses." In response to the usual "roads are often drifted in the winter and impassable from the mud in the spring" argument, Superintendent Devine of North Dakota asks: "Shall it be the horses or the children that shall wade through?"

Remind your opponent that *transportation* is a *fact* in Missouri, but done at private expense. I wish we had data showing the expense and extent of the present practice of carrying country boys and girls to the village or town high school.

It would help matters if farmers would examine the expense account for tuition alone paid for the older children in town schools. In Winnebago county, Illinois, between 1895-1904 more than $30,000 in tuition was paid at private expense. Iowa's 1909 report shows 14,034 country children paying tuition into the town corporations to the amount of $176,270. Missouri's 1909 report will show 5,713 non-resident pupils attending town schools; estimating the average yearly tuition at $20.00, our farmers have paid $100,000 in addition towards maintaining local schools that are inadequate and more expensive than those of our best city systems.

I do not want to be understood as advocating the centralization of school districts as a state wide measure in the sense that county supervision is; what I do urge is a state-wide publicity campaign by the various educational forces showing prevalent conditions and suggesting various means of improvement that will crystalize into effective laws, for an aroused public conscience must be back of legislation to make it effective; and this appeal is made in behalf of the children of Missouri.

TEACHING DOMESTIC SCIENCE IN THE RURAL SCHOOL.

(Mrs. Ivy Harner Selvidge, Columbia, Mo.)

The possibilities of Domestic Science in the one teacher rural school has been much discussed in meetings of those interested in Domestic Science subjects. All agree that it should be taught, but many doubt that it is practicable under existing conditions. The argument is brought forward that the teacher is now teaching more subjects than she can handle well. It was noticeable in Missouri that when it was decided that Agriculture should be taught in the rural schools such arguments did not prevail. Practically none of the teachers of the rural schools had had any work in Agriculture. What did they do? They filled our summer schools in the Normals and in the University and were given a course in agriculture for the rural schools, adapted to their needs as rural school teachers. They went back to their work the following year and began, in a small way perhaps, to teach the elements of Agriculture. As I see it, exactly such a procedure is necessary to put Domestic Science in rural schools. I have little faith that the women of the State, as a whole, will demand it. New things in our school courses do not come that way. I have however great faith in the efficacy of the demands of women's organizations of whatever kind, when they are applied to those who decide upon the course of study for our schools. Let the Home Economics departments of the clubs of the State actively espouse the cause of Domestic Science education and put its sentiment into a demand that this be the next step in our industrial educational projects, and it will not be long before a beginning is made as it now has been made in teaching Agriculture.

Many persons would favor the work in rural schools if they believed it were practicable. To show how such a course may be given in the 'little red school house at the cross roads' is the object of this discussion.

Modern educational methods seek to bring the child into close touch with his surroundings. He is interested in the things of his daily life and the activities of the community. In Domestic Science in rural schools I would apply this same principle. It is in fact the key note to its success. Given then the rural school, with its ever present lack of funds, the average rural teacher who has spent two months in a summer school where she pursued a course in Domestic Science suited to her needs as a rural teacher, and where under a trained teacher in home economics she has worked out some things which she may carry out successfully in her school with little equipment, how then shall she go about it? In the first place she will need from $10.00 to $20.00 for equipment. With this she will buy necessary cooking utensils and a small alcohol or coal oil stove. In the course which she has worked out will be found four general subjects, namely: "The Home," "Sanitation and Hygiene," "Food" and "Sewing." Perhaps in the beginning she will confine herself to one of these, say "Food," but in this discussion I shall show how each may be related to the active home life of the child.

When school begins in the autumn we will begin our work in foods on fruit. Enough fruit may be obtained to study a few typical ones and how to can and preserve them. The operations will be simple but the teacher will impress upon her pupils the underlying principles in the preservation of foods, and both boys and girls will apply these principles to their work. The tangible results are some canned fruit, jelly, pickles and preserves. Later it is butchering time on the farms of the neighborhood. This is the best opportunity for studying meats. A visit to the place where the work is going on will interest the children in the location of the different cuts and the best methods of cooking each. The teacher will interest them in the composition of different kinds of meat. Some of the farmers will be curing their own meat. Here is a good opportunity to follow up the subject of preservation of fruits with that of preservation of meats. Visit the smoke-house. Get the different farmers' ideas of methods of curing, and let the teacher supplement them with the whys and wherefores. As Thanksgiving draws near thoughts of children turn to turkey. Take up the subject of fowls and game. Rabbits, squirrels and quail are never beyond the reach of the average school boy. Such an opportunity for material gives the rural teacher a decided advantage.

As Christmas approaches how easy to interest the children, girls especially, in sewing. Visions of little gifts for parents and friends made by the child herself are incentive enough to take the child past eight years old through the elements of plain sewing. Afterwards the interest in a garment for herself is equally alluring. Or suppose it is foods which claim attention. Christmas and candy! Sugar is one of the food principles. Let us study it. In the process of studying it we may use the nuts stored up in the early fall from the neighboring walnut trees. The result will be a splendid array of Christmas candy free from adulteration.

Happy is the school which passes through a session without an invasion of some contagious disease. During such an epidemic interest the children in disenfectants, care of the eyes after measles, etc. Let them know something of the history and the cause of the disease, the part of the body affected and how the disease is spread. Ask the doctor who practices in the neighborhood, and who has the confidence of the children to stop at the school house some day and talk to the children on some subject he deems important to them at that time. During the winter months the work in foods might be in the starchy foods which keep well. During this period, too, when the farmer has more time for recreation than at any other, instead of having the regular Friday afternoon work, invite the parents to visit the school and let the children make and serve light refreshments. Instead of entertaining them with literary masterpieces have several pupils read short compositions telling something of the history and preparation of the food that was served.

In the spring perhaps some one in the neighborhood is building a new house or an addition to his house which will give an opportunity for the study of house plans. In every home there will be house-cleaning. Let the teacher and pupils get interested in paint and paper, curtains and rugs. Get paint color cards and samples of wall paper and call their attention to colors that harmonize and to those which do not. It is wonderful how interesting this subject becomes when brought to their notice and often makes a beginning in the education of the child toward harmonious shades both in house furnishing and in clothing.

Plan a fishing party and give a practical lesson on camp cookery on the grounds. Help the pupil help himself to have a good time.

In this suggestive work which I have proposed I believe I have answered the question, 'Is it practicable to teach Domestic Science in the rural school,' in the affirmative. I have not meant to outline a course but simply to suggest a few of the many places where such work may touch vitally the life and interests of the child. Lack of skill on the part of the teacher would make the work very elementary in the beginning, but in the course of a few years it would take on more definite shape.

Moreover all this work may be made to form a most stimulating basis for the less interesting reading, writing, and number work of the school; and time saved, rather than lost by the introduction of these home topics.

THE TRAINING OF YOUNG CHILDREN IN THE HOME.

(Elizabeth Houx Williams, (Mrs. W. S.) Columbia, Mo.)

There are two things to be considered in the training of children: First, the child. We must have a conception of the material we have to work upon. We must understand the child, in a measure at least. Secondly, we must have a conception of what we are training him for. What conditions must he meet? What ideals must he live up to? The American child has different conditions to meet, and different ideals to live up to, from the Chinese child or the Eskimo child.

The dominant note in American ideals is freedom; freedom of thought, freedom of action, freedom of press. Freedom is in the air. Is all this freedom a good thing? Yes, if we are trained for freedom. If we have more freedom in America, we have greater responsibilities.

There is a necessity for better training. If a child is to be trained for freedom he must be trained to make wise choices. Freedom is often mistaken for license to do as one pleases. We are free to do as we please only when we will to do right.

The authority of the church, of government, of parents, is not what it once was; is not what it is in other countries. In religion man recognizes no authority but his own conscience; in government, no authority except by consent of the governed. Authority is passing away. President Eliot says: "The generations of the future must be led, not driven."

Should there be no authority in the home except by consent of the governed? I have talked with a number of people upon the training of children. The central thought in the minds of those with whom I have talked is obedience. A child's will must be subjugated to the parent's will. He must obey without asking why, or knowing why One person says, the child has no reasoning powers, a parent must make choices for him until he is old enough to reason. Cannot a very young child associate cause and effect, can he not make choices? How can we train him to make wise choices? We do not say to a child who cannot walk, "You cannot walk, you will fall if you try. I will walk for you until you know how." Neither should we say to a child, "You cannot make right choices. I will make them for you until you know how." He learns to walk by trying. He learns to make right choices by trying. We are there to guide him and to pick him up if he falls. He can learn only by experience. He wants to touch something that is hot; if it will not injure him let him touch it. Warn him, "It is hot, it will burn you." He touches it; he gets a knowledge of what *hot* is, and of what burn is. He associates cause and effect. The next time you warn him, "That is hot, it will burn," you can trust him to make a wise choice. You have obedience by consent of the governed.

By repeated experience the child learns that you are a safe guide, that you do not interfere with his activities except when it is for his good. He renders the parent reasonable, willing obedience. This method of training the will to obedience will succeed. It will take more time than to subjugate his will to that of the parent; but what is lost in time is gained in the ability of the child to choose wisely when the parent's back is turned.

But, you ask, if he does not consent to be governed, how would you deal with him? We must govern him as in state government, by disciplining him. A spanking sometimes aids a child in making wise choices. It seems to me that the main point in dealing with the will of the child, is to get him to make right choices to lead him to see truth.

Control must in time come from within, not from without. To subjugate the will is in accordance with the old idea that the child is born with all evil tendencies that must be suppressed. If you are going to save a child, suppress all natural instincts. Teach him to stand aloof from the world and worldly amusements, to be serious, to devote his time to introspection. Teach him to be good.

The idea of today is, be master of youfself, live right, be joyous, give yourself to the world to make it better and happier. Do good. Self expression instead of suppression. The science of today teaches us that the child of today comes of a long line of ancestors who were fit to survive; that the individuals of the race who have had tendencies that were detrimental to life, have been eliminated. The instincts and tendencies that we find in the child are principally good, and make for life. Then in training the child, should we not take into account the natural tendencies of the child, and direct them, not suppress them.

The play instinct is the most pronounced instinct in the child. The old system of education suppressed the play instinct, until we have many grown people who do not know how to play. Today, play is being utilized, not only in training the young, but in preserving youth in adults. The whole world is seeking leisure in which to play. The playground movement, athletics, sports of all kinds for both young and old are indications that the play instinct is being fostered. We need play that we may have ability to work. A child is fortunate to have parents who have not lost the play instinct—parents who can enter into his life with enthusiasm and play with him occasionally. He cannot come to our plane of thought; we must get on the plane of his interests. We can sing with him, we can dance with him, we can play games. Through songs and games we can give him ideals that are worthy, and that he will work over into his life.

Thus far we have considered the child and his training in rather a general way. We wish now to specialize and consider the training of the child through play. Every healthy child is bubbling over with energy and enthusiasm which comes from within, and has an outward expression in his play. The amount of play there is in a child is the measure of his vitality, of his health. When a child ceases to play we know that he is not feeling well, that his vital forces are below par. If a child is sick, the best indication that he is getting well is his desire to play; often this desire is seen before he has the strength to exert himself. The child from birth is perpetual motion, when he is awake. He wiggles and squirms, throws his hands and feet; he coos and laughs. This is his exercise, his play. Then he crawls, and walks, and pounds. As his strength increases he runs, he jumps, he throws, he shouts and laughs; ever with increasing vigor and noise, until we are forced occasionally to say, "sit down and be quiet." Cannot children play without all this activity and noise? Yes, but he cannot get the expansion of lungs that he needs if he makes no noise with his mouth except in conversational tones. He cannot develop the fundamental muscles of the trunk, and legs, and arms by sitting down and using his fingers and eyes. If he uses his fingers and eyes too much, his nerves and eyes must suffer. He must have general activities of the body before he specializes. So do not restrain him in his free, spontaneous play, unless he is doing something injurious to himself or to some one else. If we deprive him of play, we rob him of physical development, of motor ability, of youthful joyousness and enthusiasm. The physical training of a child is gotten through play. With careful directing, much intellectual and moral training can be gotten through play, as well. Very young children can be taught to observe, and take an interest in nature; to know birds and to recognize their songs; to know plants and flowers and grains; to know animals and their habits, their uses, and how they serve us. As they observe they ask questions, they begin to think, to reason about things. The country bred child has the advantage over the city bred child in his familiarity and intimacy with nature.

The tendency of young children is to make use of all their knowledge in their plays. They imitate the movements and sounds of animals; they hop like bunnies, gallop as horses, bleat like sheep, cackle and crow like chickens. They impersonate the people they know, and live their lives for a time: "You be the mother, I'll be the father, you be the baby," or "You be Mrs. A and I'll be Mrs. B." They are the postman, the milk-man, the maid-servant—every person they know in the home and community; they keep house, they wash and iron and cook; they care for the sick; they pack up and take journeys; they play soldier. When they have exhausted the world about them they want to know about the outside world. You tell them a story about fairies, or giants, or foreign peoples; they impersonate these. What a wonderful imagination? It is well trained in their play. With a little assistance they dramatize, they play Santa Claus, "The Three Bears," "The Shoemaker and the Elves." As a child thinketh, so is he. Should we not take advantage of this natural tendency in children to carry over their knowledge into action, or conduct. If they are trained to think right, will they not act right? Give them the knowledge they should have: It is the guide, the staff of the will.

In all play with other children there is moral training—there is good discipline. He must learn to take his turn, to play fair, to be honest, to be truthful, to co-operate, to take defeat. If he does not play right he must be deprived of playing with others until he will play right.

After a child has done in his imagination all the things he knows, he wants to really help with the industries of the home. A girl wants to sew, to dry dishes, to set the table; a boy to rake, to plant, to take up ashes, to bring in wood. It is so much easier to say, "You cannot do this, you will break something, or injure something; run along and play;" or to say, "I haven't time to give you an industrial training." It takes time to thread needles, to take out knots and wrong stitches, to train children to use scissors, to use hammer, rake and shovel, to do things, to make things, to do some kindergarten work. But is not this training worth the time it takes? It is play as long as it is interesting to the child and gives pleasure in doing. It has a moral value as well as an industrial one. It teaches the child usefulness, helpfulness, consideration for others, service.

Is it not important that we give the child the right attitude toward work? Should not every one be trained to take a part in the world's work? There is need of trained laborers in the industrial, intellectual, artistic and religious world. If we are properly trained for our work, if we have not so much to do that it is drudgery, we can have the play attitude toward our work. The child will imbibe this spirit from us. We are not here for self-ease, or for self indulgence, but for service. The greatest of all Teachers made service the test of fitness for life.

To sum up: We must give our children the physical basis to meet life. We must train them to right thinking, and right acting; we must train them for noble living.

THE BROOD SOW AND HER LITTER.

(By F. G. King, Former Live Stock Assistant, Missouri State Board of Agriculture.)

SUMMARY.

All growing animals must be fed so as to have an abundance of protein and ash for the formation of muscle and bone to meet the requirements of growth. The brood sow must be fed a ration that will have her gaining in flesh at breeding time. The pregnant sow must be fed a feed that is not only rich in protein and ash, but is also somewhat bulky, so as to satisfy her appetite, and a laxative in order to keep her system in the proper condition.

If the sow is in proper physical condition, healthy, and not too fat, there need be no trouble at farrowing time. Each sow should be by herself in a cot, having a rail around the outside, to prevent the pigs from crushing.

The feeding of the sow while suckling pigs, must be heavier and contain more food nutrients than at any other period in her life. Sows often break down from lack of ash in their feed at this time.

The suckling pig should have a creep into which it can go to receive food separate from the sow. This food should consist of grain, in the form of slop, and be of a narrow nutritive ratio.

At weaning time the sow should be removed from the pasture, leaving the pig in familiar surroundings, in order to avoid restlessness. The sow should be returned a few times in order to prevent the spoiling of the udder.

The pig should receive the same feed after weaning as before, only in larger quantities. As the pig grows, however, the feed can be changed to a dryer feed.

Scours in young pigs are usually caused by unsanitary conditions, sour or unclean feed, or by a feverish condition of the sow. They are prevented by changing the feed or by giving the sow a physic.

Lice are prevented by the use of dips, coal oil, crude oils, etc., either sprayed upon the hogs or by having the hogs dipped.

Thumps are usually caused by heavy feeding, with lack of exercise,

and may be remedied by cutting down the feed and inducing the pigs to take exercise.

Worms are best cured by the use of turpentine, santonin, etc. The majority of farmers, however, adopt preventive measures rather than curative measures, and feed such remedies as salt, ashes, charcoal, coperas, etc.

Pork will, in the future, as it has been in the past, be the most profitable manner of marketing the great corn crop of the middle states. This is especially true in the case of the small farmer who understands the importance of maintaining the fertility of his soil by returning to the soil its fertility by the feeding of the crops on the land that has produced them, and who cannot afford to put a large amount of capital and equipment into breeding stock. No other domestic animal will reproduce itself as quickly nor in so great numbers as the hog. Neither will any other domestic animal, except young lambs, make so economical gains during the fattening period as the ordinary porker.

Missouri is excelled in the production of pork only by Iowa, Illinois and Nebraska—states having a much larger acreage devoted to corn raising, showing that the production of corn and hogs go hand in hand, so to speak. For the amount of land devoted to corn raising, no state in the Union excels Missouri in the number of hogs produced. And why should this not be true? No point in the State is more than twelve hours ride from a great packing center, with a stock market that pays full market value for hogs. There is no part of the State that will not grow to perfection some kind of leguminous crop which makes ideal hog pasture, and very few sections but produce an abundance of corn on which to finish what the pasture has begun.

The ever increasing value of land demands that more attention be paid to the care and management of all kinds of live stock, and especially with stock raised from birth to maturity on the farms of the corn-belt. As hogs are one of the most important products of the State, the care and management of the brood sow and her litter should be given more attention. The raising of a pig to weaning time and getting him well started after weaning means, in most cases, a money-making porker for his producer. During this time the foundation is being laid for the fat hog of a few months later.

With the possible exception of better pastures, nothing will increase the profit of hog raising in the State more than better care and attention of the brood sow and her litter. With this growing need in mind, a list of questions relative to the care of the brood sow and litter, was addressed to several hundred of the most successful hog raisers of the State. This list of questions covered the more important phases of the care of breeding stock and of pigs up to the age of four months. As the correspondents replying to this list represent the ownership of more than one thousand brood sows, producing more than thirteen thousand pigs yearly, the value of their answers is very great, since the most successful farmers are, as a general thing, usually right in their practices.

FEEDING GROWING ANIMALS.

Underlying and controlling all practices of farming and stock raising are basic principles, which either consciously or unconsciously are recognized and followed by the most successful farmers. These principles have been discovered and demonstrated by investigators on agricultural subjects until they can be stated and discussed with a very certain degree of accuracy. The truth of these two statements is nowhere more clearly demonstrated than in the practices followed with brood sows and their litters. As will be seen from the answers to the list of questions, the fact is recognized that the brood sow, whether pregnant or suckling her pigs, is being called upon to manufacture from common feeding stuff the bone and muscle for her growing young. In other words, she is a machine transforming one kind of material into a substance of the same material, but of entirely different form. In doing this the machinery, *her body,* must be kept in proper running condition, and the raw material, *the food,* must be of the proper composition in order to furnish the finished product, *the pig,* with the necessary food elements.

Of prime importance to growing pigs, and all other growing animals, is the question of bone and muscle forming foods, for until the age of four months, which time only in the life of the pig this bulletin is intended to discuss, the desire of the hog raiser is to grow rather than to fatten the pig. Only the food containing an abundance of ash can furnish the nutrients required for the formation of bone; only feeds containing an abundance of protein can furnish the nutrients necessary for the formation of muscle. So, the growing animal, must have a ration containing a high percentage of protein and ash. The fat and starchy feeds, and also protein, are used for the production of energy and heat and for laying on fat. In other words, the ash and protein feeds are used for making machinery and repairing the old tissues, while the fats and starches are used for the fuel to run the machinery and for storage of energy in the form of fat. As the object of the feeder is to grow, rather than fatten the pig or pregnant sow, the per cent. of fat-forming food should not be as great as when the fattening period is reached.

In addition to the question of food nutrients which effect all growing animals, there are other factors effecting the food of the brood sow, one of which is the laxative effect of the food given the pregnant female. Not only is she the provider of food, but her body is the guardian and protector of the unborn young. Any cause that may result in a disarrangement of her body will probably result in the death or serious injury to the young. A food that constipates a pregnant sow will cause a weak, sickly litter. Not only must the food be laxative, but the sow must take enough exercise to insure the proper passage from her body of all refuse feed stuff in the farm of feces. This is such an important factor that it may mean the success or failure of the litter, for a sow that does not have, during pregnancy, a free passage of waste matter, cannot produce a strong, healthy litter.

The question of the bulk of the feed is often of great importance, especially in the feeding of brood sows. The appetite of any animal is not satisfied until the stomach is full. A food that is very concentrated, such as the grains, etc., contains so much nutritive value that feeding so as to satisfy the hunger on such feeds results in the brood sow getting very fat. As it is not desirable to have this occur, the only way to prevent this, and at the same time satisfy the appetite of the sow, is to feed a more bulky ration. This is very easily accomplished during the grass season when pasture is available, but in winter it requires the feeding of more than the very concentrated grains or feeding stuffs.

The following table of the composition of the more common feeds on the farm represents the different properties desired for feeding stock. The muscle and bone forming elements are represented by the protein and ash contents, respectively, the energy and fat producing elements by the starch and fat content, while the bulk is represented by the crude fiber and water content.

	Water, %	Ash, %	Protein, %	Starch or sugar, %	Fat, %	Fibre, %
Corn	10.6	1.5	10.2	70.4	5.0	2.2
Milk	87.2	.7	3.5	4.9	3.7	....
Fresh clover	70.8	2.1	4.4	13.5	1.1	8.1
Fresh alfalfa	71.8	2.7	4.8	12.3	1.0	7.4
Bluegrass	65.1	2.8	4.1	17.6	1.3	9.1
Bran	12.3	5.9	16.0	53.7	4.0	8.1
Middlings or shorts	12.1	3.3	15.6	60.4	4.0	4.6
Linseed oilmeal	9.2	5.7	32.9	35.4	7.9	8.9
Tankage (quite variable)		8 to 20	60.	....	8.	....

In studying this table the fact should be borne in mind that it is the proportion of ash and protein to starch and fat that determines the nutritive ratio instead of the actual per cent. of each nutrient. While the laxative effect cannot be reduced to figures, the relative power is well known. The feeds, excepting the green grasses, stand in the following relation to each other as to laxative effect, the more laxative being placed at the head of the list: Linseed oilmeal, bran, milk, tankage, shorts, corn.

It will be noted that our principle feed, corn, is lacking in protein, ash, bulk and laxative effect, all of which are necessary for the best development in breeding and growing stock. This defect, however, can be easily remedied in summer by a good pasture of clover, alfalfa, and to a great extent, by bluegrass; and in winter by the use of other feeds in connection with corn, such as leguminous hay, milk, bran, oilmeal and shorts or tankage, the last three of which, however, are lacking in bulk for brood sows not having access to pasture or bulkier feeds.

Another factor that often means success or failure, is that of exercise for the brood sow and litter. It is almost impossible to keep in good condition the digestive and reproductive organs of breeding and growing stock that do not have sufficient exercise. It not only tends to cause them to fatten, but it also leaves the digestive tract closed and leads to constipation and other disarrangements of the system which, occurring in the pregnant sow, cause weak and sickly litters to be farrowed. Ordinarily it is no trouble to get sows or pigs to take sufficient exercise, except in very bad weather, especially if a winter pasture, such as wheat or rye, is provided, but should a sow become sluggish and refuse to take a good deal of exercise some means of compelling her to do so should be resorted to.

THE BROOD SOW.

The importance of the brood sow on the farm is hardly appreciated until we stop to consider that she must have under her care for six months all the future porkers produced on the farm. The average number of sows kept by the correspondents who answered the list of questions is 13.4. Of the total number, 85.5 per cent. of the farmers state that they prefer to have each sow produce two litters yearly, while 14.5 per cent. prefer only one litter per sow. Of the former class, the replies show that each sow produces on an average 1.81 litters yearly, or in other words, 19 per cent. of the sows fail to produce more than one litter yearly, where two is preferred. The average of the hog raisers desiring only one litter yearly per sow shows that 96.4 per cent. of the sows produce a litter, thus leaving 3.6 per cent. not producing at all. The average number of pigs per litter from all the sows is 7.07. According to these averages the man who keeps the sows the entire year and tries to raise two litters may expect each sow to produce him in the year from twelve to thirteen pigs. With the labor not only of maintaining her own body, but also that of reproducing herself twelve or thirteen times yearly, an average of more than once per month, the strain on her system is necessarily very great. To meet this constant strain good care and feed must be given her in order to get the best returns.

Care of Sow Before Breeding.—The unbred sow is in a state of maintenance, in storage, so to speak, for future use, and the care and feed bestowed upon her at this very time is merely to get her into condition for future usefulness. As a general thing, very little grain feed is required in addition to a good clover, alfalfa or bluegrass pasture, in order to maintain an unbred sow in good breeding condition. The nature of the pasture (principally clover) used by our correspondents, permits the grain used to be of a fat-forming nature. We find that all except three of the seventy-five correspondents feed some corn to their unbred sows. One of these three feeds heavily on shipstuff, and the other two use alfalfa and clover pasture, without grain. In spite of the fact, however, that open sows occur at a time of year when pasture is available and balances up the corn to a great extent, we find that many of our correspondents do not consider corn alone sufficient grain for their sows, and 4 per cent. use bran, 21 per cent. shorts or middlings, 5 per cent. oilmeal and 4 per cent. either tankage or meat meal.

From the nature of the replies of all, and specific mention of a few of them, the same principle is recognized in breeding sows that has long been practiced by shepherds, viz., that animals in medium flesh will conceive more readily and bear a greater number of young if they are bred while gaining in flesh. That some hog raisers follow this practice is shown by their replies, concerning which a reply often reads, "A little extra before breeding, so as to have them mending at breeding time," or, "A strong feed of corn with pasture for two weeks before and during breeding season," or, "Run on clover after weaning pigs, until six weeks before breeding, when we feed a grain ration and get them to thriving." With the sow producing two litters yearly, however, barely time is given to get the sow to thriving, so, for general conditions, we find that grain is fed at all times in order to get her into the desired flesh for breeding at the proper time.

Care of Pregnant Sows.—From the time of breeding until the pigs are large enough to eat well, is a very important period in the care and feeding of the sow. During this period the sow is not only keeping up her own body, but is also performing the more difficult task of reproducing herself in the form of pigs. The feed of the sow should therefore contain the material to form the muscle and bone of these young pigs, and at the same time not get the sow so fat that she becomes sluggish. Of course, corn is too cheap and common a feed to be left out of any ordinary feeding ration, but the cheapness of a ration of corn which is a fattening rather than a growing feed, must not overbalance everything else. The effect of corn alone upon the internal organs of growing and breeding stock is shown by the following trial made at the Alabama Experiment Station, Bulletin 82, with pigs fed for 119 days, with three pigs per lot:

Ration.	Corn alone.	Cowpeas alone.	One-half corn, one-half cowpeas.	One-half corn, one-half wheat bran.
	Lbs.	Lbs.	Lbs.	Lbs.
Weight of liver	1.99	2.73	2.05	2.75
Weight of lungs	.55	.54	.55	.65
Weight of kidneys	.21	.38	.31	.32
Weight of spleen	.096	.175	.135	.136
Weight of heart	.270	.336	.320	.310
Per cent of fat on intestines	2.30	1.10	1.88	1.76

It will be noted that with the exception of the lungs the lot fed on corn alone showed much smaller development of vital organs than the lots fed a more nitrogenous ration. On the other hand, the per cent. of fat laid on the intestines, hence on all internal organs, was very much larger in the corn-fed lot than in any other lot. This experiment shows us that for breeding stock, animals made fat on corn are apt to have more internal fat than those made fat on a more nitrogenous ration. As the laying on of fat internally has an injurious effect on breeding stock, the practice of farmers who trust principally to corn for their brood sow ration of not wanting to get the sows to carrying much flesh while pregnant, is well founded. For it is a well known fact that farmers who feed sows very little except corn, prefer to keep sows in a much thinner condition than those who feed a ration containing more protein in proportion to the starch in the food.

From the data given above, it is readily seen that corn alone is not an ideal feed for breeding stock, but needs to be supplemented by a feed containing more muscle and bone forming material. This is usually in the form of some pasture. Very few of our correspondents do not feed some ear corn to brood sows, but the ones that feed corn alone as the sole grain ration also have good pasture for them to run on and limit the grain. When a good pasture of alfalfa or clover of some kind can be secured, a small amount of corn makes a good feed for sows. But if these kinds of forage are not provided, a supplement containing more bulk and more mineral and protein content must be fed with corn to get best results. This condition prevails in winter and sometimes in the dry part of the summer.

Our replies show that pasture is used as long as it is possible to use it. As for grain fed, the following table shows the number that feed the different kinds of feed as a supplement to corn for pregnant sows:

Number of replies	74
Number feeding shorts	15
Number feeding linseed oil meal	9
Number feeding bran	8
Number feeding oats	5
Number feeding tankage or meat meal	5

This supplement was fed mostly in the form of slop, which in addition to the nature of the feed, would help to keep the bowels of the sow loose and in good condition.

During the winter months, however, is the time when laxative feeds and exercise are most needed, for there is a tendency for sows not to take enough exercise and to become constipated. The best way to overcome this is to have a good winter pasture, concerning which the monthly Bulletin of the Missouri State Board of Agriculture for May, 1909, information for which was gathered in the same manner as for this, says: "For early winter pasture the succulent forages may do well until freezing weather. Clover, alfalfa, etc., if of good growth, may last that long. Rape will make good pasture sometimes as late as Christmas. Cowpeas can be pastured late in the fall and give a large amount of forage. But from freezing time until grass comes in spring, any green forage for hogs requires a special crop. Rye, wheat and bluegrass are about the only plants that are of much value for winter months. If the bluegrass has a good growth in the fall, it makes excellent pasture in winter and early spring. If pastured close in the fall, however, this grass furnishes little pasture during the winter. Wheat is in general use a winter crop for pigs and can be sown at the right time to make a good crop of grain the next summer, and at the same time furnish good pasture in either winter or early spring. Rye is in more general use as a winter forage for hogs than any other crop, as is shown by the fact that fifty-six out of one hundred fifty-six replies as to what winter pasture was provided for hogs, gave rye; thirty-seven said no pasture was furnished; twenty-nine gave wheat, and thirty-one gave bluegrass."

It will be noted that only thirty-seven out of one-hundred fifty-six replies said that no winter pasture was provided, thus showing the value of having a green feed as much as possible in winter. The pasture serves the two-fold purpose of furnishing a nutritious and succulent feed and at the same time making the sow take a larger amount of exercise in gathering the feed, both of which tend to keep her in better health and to give stronger, better pigs. It is impractical, however, to hope to provide sufficient green feed in winter to balance a pure corn ration, so a form of protein and ash must be provided.

One of the cheapest and most convenient methods of getting these forms of nutrients is by use of some of the leguminous hays—clover, alfalfa and cowpeas. This method was not mentioned in any of the replies, but has been found so useful by the experiment stations and hog raisers that it should be discussed. The ability of hogs to use this kind of food is shown by the following trial from the Oklahoma Experiment Station, where a test lasting 55 days with five hogs per lot, weighing 190 pounds each, was made and reported in Bulletin 80. One lot received corn meal alone, another corn meal and all the alfalfa hay they would eat, while the third lot received cowpea hay instead of alfalfa. The results for the 55 days feed is as follows:

Ration.	Gain per pig.	Daily gain.	Feed per 100 lbs. gain.
Corn meal	34.6	.629	801
Corn meal and alfalfa hay	57	1.036	614
Corn meal and cowpea hay	51.6	.938	724

It is here seen that even fattening hogs will eat enough hay to materially decrease the cost of gains as compared with corn alone.

A trial at the Nebraska Experiment Station and reported in Press Bulletin No. 20, gives data along the same line. In this trial seven pigs weighing from 81 to 86 pounds each, were placed in each lot and fed for 84 days, with the following results:

Ration.	Gain per pig, lbs.	Daily gain, lbs.	Feed per 100 lbs. gain, lbs.
Corn meal	86.4	1.03	496
Corn meal, ¾; shorts, ¼	92.1	1.09	466
Corn meal, ¾; ground alfalfa, ¼	89.3	1.06	481
Corn meal, ¾; cut alfalfa, ¼	90.0	1.07	477
Corn meal, ¾; bran, ¼	67.7	.80	589
Corn meal, ½; shorts, ½	75.7	.90	548
Corn meal, ½; cut alfalfa, ½	77.5	.92	544
Corn meal, ½; ground alfalfa, ½	74.6	.89	566

It will be noted that even for young fattening hogs, the ration containing the hay, either cut or ground, made a very fair comparison with feeds of a more fattening and less bulky nature. The author of the above bulletin has the following to report concerning hay as a brood sow ration: In a test thirteen brood sows averaging 258 pounds each were fed a ration of two pounds of corn meal and six pounds of alfalfa hay throughout the winter. At the end of the fifth week, when the sows began to farrow, the average weight was 264 pounds. "These sows kept in fine condition, farrowing during February and March, and saved large litters in every case."

For hog feed hay should be rather fine and consist as largely as possible of leaves. The last cutting of alfalfa is eaten up without waste, but for coarser alfalfa and cowpeas and clover the coarse stems are left. Clover or cowpea hay from which the leaves have been lost, is of little value as hog feed, and should not be relied upon. The best method of feeding hay to hogs is in racks set in shallow troughs about 4 inches deep and 24 inches wide, to catch the shattered leaves, so the hogs can get them.

Care of the Sow at Farrowing Time.—The care of the sow during the farrowing period, one of the most critical stages in the whole management of the hog, is most important. The care at this time depends very largely on the animal and the weather conditions. If the sow is in good health and vigorous, there is usually no trouble to be feared. She should be placed in her quarters where she is to farrow a few days before she is due to farrow, in order to let her get accustomed to things. The feed should be limited a few days before farrowing, and should be of a laxative nature. Ordinarily it is better to leave the sow to herself than to try to help her, which, in her feverish condition, excites her and often causes her to trample upon or mash the pigs.

In reply to the question as to the most serious factor in raising young pigs, six out of sixty-four said that the sow mashing the pigs is the most serious one. Of course, it is impossible to entirely prevent this loss, but the conditions that will reduce it to a minimum is to have the sow in good physical condition, and receiving a small amount of warm laxative feed for a day before farrowing. In the farrowing pen, from which the other hogs should be excluded, there should be a rail set eight inches from the floor and out six or eight inches from the wall. This prevents the sow from lying too close to the wall, and gives the pigs a chance to creep under the rails for protection. With these precautions, and a small amount of clean bedding, the sow should do well at farrowing time. If the weather is not too cold the sow should be left alone. But if the weather is very cold, it often proves profitable to have a warm blanket with a jug of heated water or a hot stone wrapped in a blanket. The pigs can be placed in this basket and covered with the blanket until the sow has finished farrowing, when all the pigs can be placed to the teats without having been chilled or injured by the sow's restlessness in farrowing. The afterbirth should also be removed from the pen so that the sow will not eat it, for there is good reason to believe that some sows are started to eating pigs by first eating the afterbirth.

Feeding the Sow While Suckling Pigs.—From the time the pigs are born until they are weaned, the sow is placed under the heaviest strain. This is a period when it requires good feed to prevent the sow from getting poor if she is a good enough milker to get the best growth in the pigs. For a few hours after the sow has farrowed she needs no feed other than water that has been warmed enough to have the chill removed. After twelve or twenty-four hours she should receive a warm feed of medium to thin slop of some kind of ground feed or of milk. After this the feed should be gradually increased until the sow is receiving as much feed as she requires. The feeding of very cold feed or water to newly-farrowed sows often causes an indigestion and chill that not only injures the sow, but prevents the proper flow of milk. Too heavy feeding for the first few days may result in the too sudden stimulation of milk flow, which scours the pigs and often results in their death or permanent injury. After the pigs are large enough to use all the milk, the more milk-producing feed, the better.

The heavy strain upon the sow while suckling pigs is shown by the replies to the question as to the feed given sows while suckling pigs. The following table shows the number and per cent. of farmers feeding the different kinds of feed with or without corn:

	No. of replies.	Per cent of whole.
Total number of replies	74	....
Corn alone	11	14.9
Shorts or middlings	23	31.1
Bran	11	14.9
Linseed oilmeal	9	12.2
Milk	8	10.8
Slop (kind of grain not mentioned)	8	10.8
Tankage or meat meal	7	9.5
Oats	2	2.7
Kitchen slop	2	2.7

These results show that 85.1 per cent. of the hog-raisers use a mixed feed for sows suckling pigs, and 14.9 per cent. use corn alone. These, of course, are used in connection with pasture, which in itself gives much bone and muscle-forming food. All the supplements, except oats, are fed in the form of slop.

It is noted that all the feeds used for slop are ones that contain a good percentage of protein and ash for the formation of muscle and bone. The need of this kind of feed for sows suckling pigs is pointed out by Professor Forbes in Bulletin 201 of the Ohio Experiment Station, from which the following extract is taken: "The lack of mineral nutriment in the hog's ration often results in the animal breaking down on the way to market. It is often responsible, also, for the breaking down of sows with litters. The secretion of milk calls for more calcium and phosphorous than corn contains. To make good the deficiency, the sow takes calcium phosphate from her own bones. This appears to cause a weakening of the tendenous attachments, but may proceed until the shaft of leg bone fractures. These cases of breaking down of brood sows are curable without special difficulty." "A young hog in one of the author's experiments, after several weeks on a low-ash ration, broke a leg, but made a complete recovery after a number of weeks on a high-ash ration."

Of course, the demands on the sow are not as heavy when the pigs are small as when large, and we find that the practice is to increase the feed as the demand upon the sow grows by the pigs getting older. This is shown by such replies as the following: "While pigs are young, I feed slop of tankage, oilmeal, etc., with corn, and increase the amount of corn as the pigs grow," or, "For a few days after farrowing, I feed one ear of corn and a thin bran slop twice daily, and after three days I increase the feed until in two weeks she gets one-half gallon of rich slop and four ears of corn daily," or, "When pigs are two days old begin feeding and feed strong until pigs are weaned." As the time for weaning the pigs approaches, the milk-making feeds should be gradually decreased and the grain ration made to consist more and more of corn, thus gradually causing the sow to "dry up."

THE YOUNG PIGS.

The first four months in the pigs' life determine to a very large extent the kind of hog that will be produced in the end. In fact, a pig well started after weaning is in pretty good form for making a valuable porker. During this period the framework for the future fat hog is being produced. Too much fat and not enough frame at this period in its life often results in the pig becoming fat and "chubby" before it has reached a desirable size, and after reaching such high condition it is usually unprofitable to try to carry it to a very much heavier weight. For this reason it is desirable to make young pigs grow rapidly rather than get too fat while young. For this reason there should be an abundance of muscle and bone-producing feeds and plenty of exercise. This is especially true if any of the young stuff is to be kept for breeding purposes.

The value of bone-producing feed is shown by the results of a trial made at the Nebraska Experiment Station where four pigs, weighing 95 pounds each, were fed for 119 days on different feeds, and then killed. Eight bones from each pig were removed and broken in a machine especially made for the purpose. The results of this trial are given below:

Ration.	Average breaking strength of eight bones, lbs.	Breaking strength per 100 lbs. of live weight, lbs.
Corn meal	630.5	281.
Corn meal, 75%; shorts, 25%	729.	311.75
Corn meal, 90%; tankage, 10%	1013.	413.75
Corn meal, 90%; bone meal, 10%	1044.	467.75

The trial was repeated the next year, and in addition to the above data, the specific gravity of the bones were taken, thus showing in a general way the strength of bone for the same sized cross-section of measurement. The result of the second trial, which lasted for 154 days, with pigs that weighed 62 pounds each at the beginning of the trial:

Ration.	Average breaking strength of eight bones, lbs.	Breaking strength per 100 lbs. live weight.	Specific gravity of bones.
Corn meal	702	325	1.167
Corn meal, 75%; shorts, 25%	867	396	1.187
Corn meal, 25%; skim milk, 75%	1279	509	1.297
Corn meal, 90%; tankage, 10%	1361	580	1.326
Corn meal, 90%; bone meal, 10%	1505	681	1.346

It is readily seen from the results of these trials that for strength and quality of bone a ration consisting in part of feeds having an abundance of mineral matter or ash, gives by far the best results. It will be noted that the breaking strength of the bone per 100 pounds live weight was increased 21.8 per cent. by using shorts, 56.9 per cent. by using skim milk, 78.4 per cent. by using tankage, and 109.5 per cent. by using bone meal. This table does not indicate the effect upon the muscle development by using the higher protein feeds, but it is a well established fact that the greatest muscle development is secured when a narrow ration is fed. The development of internal organs on high and low protein rations is discussed under the paragraph on "Feeding the Pregnant Sow," where it was shown that animals fed a mixed feed produced much more growth on internal organs than did a feed of corn alone. Then for the development of pigs, whether for breeding or market purposes, a feed should be given that will furnish an abundance of bone and muscle nutriment. In addition to the grain feeds given in the table of composition of feeds, the clovers, alfalfa and other legumes, and bluegrass to a moderate degree, furnish these nutrients in abundance. A pasture of clover, alfalfa, etc., balances corn to a great extent.

Feeding the Pig While Suckling the Dam.—When the pigs are two or three weeks old they will begin to use feed other than the sow's milk. They will begin nibbling at grass and tasting the sow's food until they are soon eating a large enough quantity of food to justify the making of a creep for them where they can be fed a little extra and the sow kept away from this feed. The entire list of answers as to the kind of feed and manner of feeding of the different correspondents, is given:

"Give mill feed in slop and a little corn."

"Feed wheat middlings, skim milk and a little corn. Give middlings in slop made by mixing them in skim milk or warm water."

"Feed corn and shorts and skim milk in form of swill."

"Feed a fresh slop of skim milk and shorts. If I haven't milk I use linseed oil cake."

"Feed shipstuff and milk, mixed from one feed to the next."

"Let them begin eating with the sow. Feed dry oats and a slop of shorts and skim milk."

"Feed corn alone. I shell it for them at first."

"Feed table slop mixed with bran, oats and shorts, and let them have a little corn. Always feed the slop first, as sour slop makes them have 'pot-bellies.' "

"Feed corn and slop in a pen as soon as they will eat away from sow."

"Corn and a slop of chopped wheat and corn."

"Crushed corn and a slop of bran and water."

"Milk."

"Feed corn and milk. Give plenty of clover range, and see that they take lots of exercise. Don't cook feed or let anything sour."

"Feed a slop of shorts and skim milk."

"Feed a slop of corn chop and bran. Don't let it stand over six hours."

"Feed shorts and corn."

"Feed a slop of milk, shorts and water and either linseed oilmeal or stock food, and feed fresh."

"Feed shelled corn on pasture and a slop of shipstuff, oilmeal and bran or tankage in small amounts. Sometimes let the oilmeal soak twelve hours."

"Feed all the corn and skim milk they will eat on wheat or rye pasture. Soak the corn twelve hours."

"Let them eat with the sow."

"Feed milk and a slop of shipstuff, fed sweet with corn and wheat, if the latter is not worth more than 75 cents to 80 cents per bushel."

"Feed a slop of shipstuff and cooked corn and a little dry corn."

"Ground corn and oats with a little oil meal is fine. Keep corn in a pen with a creep for pigs."

"Feed soaked corn and a slop made by mixing shipstuff, oilmeal and milk together."

"Mix two parts shipstuff and one part bran with water to make a thick slop. Have a creep where they can be given extra feed both morning and night."

"Feed a slop of shipstuff."

"Feed corn and tankage. Give corn in ear as soon as they can crack it."

"Feed ground wheat and oats and soaked corn."

"Have a separate pen and feed plenty of corn and pasture."

"Feed a slop of shipstuff and tankage fed at once. Also, feed wheat, kitchen slop and all the sweet milk I have."

"Feed shelled corn and a slop of skim milk, shorts and tankage."

"Feed shelled corn and a heavy mash of equal parts shipstuff and bran and one-fourth as much meat meal."

"Feed corn and all the milk slop I can raise."

"Feed corn and a slop of tankage, oil meal and shipstuff, and pasture."

"Feed corn and milk."

"Let them eat with other hogs."

"Feed shorts and Alfalmo slop. In cold weather mix with warm water, in warm weather mix with cold water for dinner. Feed corn morning and night."

"Feed corn and oilmeal soaked twelve hours, and let run on pasture (clover pasture preferred).

"Alfalfa pasture and corn as soon as they will pass into a creep where the sows cannot get to it."

"Alfalfa pasture and shelled corn and a slop of equal parts oilmeal and cottonseed meal. I like them mixed better than either alone."

"Feed plenty of slop made of mill feed."

"Give free access to grass and ear corn."

"Feed milk, shorts and cooked corn. Soak shorts twelve hours and corn twenty-four hours."

"Feed with sow. Give ear corn, milk, dishwater and scraps in a slop."

"No particular feed."

"Feed slop of shipstuff and wheat bran, soaked twelve hours.

"Feed with sow. Give thick, sweet slop of water and ground feed."

"Feed ear corn, and skim milk fresh from separator, and clean pasture."

"Feed corn and let them run on grass.

"Feed shelled corn, and let them run on a large white clover pasture."

"Feed a sweet slop made of mill-feed."

"Feed ground wheat."

"Feed mostly slop of oats, corn or ground rye. Grind and sometimes cook it if I have time."

"Feed corn and slop."

"Feed corn and slop from the house and generally some skim milk."

"Feed skim milk and shipstuff."

"Feed corn and grass."

"Begin to feed them as soon as they will eat a slop of soaked oats and corn."

"Feed shelled corn and oats soaked from one feed to the next, but not soured."

"Have a clover and bluegrass pasture with a creep for pigs. Feed one ear of corn and one-half quart of slop made of bran and oilmeal. Mix bran and oilmeal dry in a trough, pour water in until a thick slop is formed, and then turn pigs into creep."

"Slop twice daily with almost all the corn they want on bluegrass pasture. Mix the slop and let it stand from one feed until the next."

"Feed pigs with the sows. Feed skim milk in a creep."

"Feed soaked or chopped grain and a slop made by stirring oilmeal into skimmed milk and kitchen slop."

"Feed some shelled corn and as much shorts and skimmed milk as possible. Mix the slop fresh each feed."

"Feed with sows on corn and grass."

"Feed shorts and fresh milk, soaked from one feed to the next."

"Feed with sows on corn and grass."

"Let the pigs run with sows in summer and feed some shorts and warm water in winter."

"Feed all they will eat of a slop made of shorts, bran, chopped corn, oats and oilmeal mixed with water and fed fresh."

"Feed with sows on a fresh slop."

It will be noted that of seventy replies, only nine mentioned feeding corn alone to the unweaned pigs. Of the feeds used to supplement the corn or to be fed without corn, skimmed milk and some kind of mill feed, such as shorts, middlings or shipstuff, were the ones most generally used. The number of farmers using the different kinds of feeds are as follows:

Kind of feed used.	No. using this kind of feed.	Per cent of total replies.
Total replies	70	....
Corn alone	9	12.9
Shipstuff or shorts	27	38.6
Mill feed (kind not mentioned)	3	4.3
Milk	25	35.7
Bran	8	11.4
Linseed oil meal	9	12.9
Oats	7	10.0
Tankage	5	7.1
Wheat	4	5.7
Meat meal	1	1.4

It will be noted that feeds are used that make a rather narrow ration, or one tending to make the pigs grow rather than fatten them. This is due not only to the fact that the proper kind of growing feed must be given, but also to the fact that pigs at this time of their lives often get too fat and do not make the proper growth. This tending to become too fat is overcome by limiting the feed somewhat and by giving an abundance of exercise. Hence, for unweaned pigs the feed must be of a rather narrow nutritive ratio, and not given in as large quantities as the pig will eat, and in addition an abundance of exercise must be furnished. This condition requires that the pig must have some kind of a green feed, such as clover, alfalfa, bluegrass, etc., which not only furnish the food nutrients but also induce exercise.

Weaning the Pig and Feeding After Weaning.—With the proper care there should be no decrease in the growth and development of the pig after weaning time. The weaning is often a time when the pigs stop growing for a period of a week or two. But if the right kind of feed is given them and they are eating well, there need be no delay in development. There are two distinct methods of weaning the pigs practiced by our correspondents. One of these methods is to let the pigs run with the sow until she weans them or until they wean themselves. This method is not as generally practiced as the other, since only eleven out of seventy-three replies mention this practice. Of course, this system makes strong pigs, but no stronger than if they are weaned earlier and given the right kind of feed, and it is much harder on the sows than if the pigs are removed earlier.

The other method practiced, and the one used by sixty-one out of seventy-two farmers making reply on this question, is to remove the sow after the pigs have learned how to eat well. The age of weaning varies from six to fourteen weeks with our correspondents, with a general average of nine weeks. The weight at weaning time varies from 20 to 70 pounds, with an average weight of 42.5 pounds per pig. When weaning time arrives, it is the practice to take the sow from the lot rather than to change the quarters of the pigs. This leaves the pigs in familiar surroundings and prevents them from getting as restless as they otherwise would. The sow is turned back into the lot for a short time every half day for a day or two, so her udder can be milked out by the pigs and prevent its spoiling. The length of time between milkings is gradually increased until the sow is dry. This, in most cases, requires but a few days. Some farmers, however, prefer to remove the pigs to a different lot rather than change the sow. At first only the strongest pigs are removed, thus leaving the weaker ones to do the milking and have the benefits therefrom for a few days longer. The weaning under all circumstances should be thorough.

The feed during weaning, and a short time afterward, should be the same as before weaning, and consist as largely as possible of soft feed, as the removal of the milk supply is taking away a very soft and palatable food. We find that twenty-eight out of sixty-four correspondents feed the same feeds after weaning as before, only with an increased amount. As they get older the amount of corn fed is increased. The replies, other than those that feed the same as before weaning, are as follows:

"Same, and then change to shorts and corn once per day."

"Give plenty of good pasture, shorts and bran slop or a little dry corn."

"Feed corn and bran or mill-feed and let them run on clover pasture. Soak the corn until soft, and make fresh swill of the bran or mill-feed."

"Feed all the middlings they will eat soaked in corn milk."

"Feed oats, corn and mill-feed.

"Feed milk, shorts and corn and oats chop cooked."

"Feed the same with cane and good pasture. The cane is fed immediately after cutting."

"Feed the same and add salt and charcoal, fed separately, so they can eat it as they want it."

"Feed corn and green feed."

"Run on clover, bluegrass and white clover pasture, and give some corn and slop."

"Feed corn and shipstuff on grass."

"Feed corn and tankage on bluegrass and white clover pasture."

"Feed all the corn they will eat and a slop made of shorts and kitchen waste."

"Feed corn and slop."

"Feed corn and milk on grass."

"Feed corn on clover and bluegrass pasture."

"Feed corn and oilmeal soaked twelve hours."

"Feed corn and kitchen slop on alfalfa pasture."

"Feed corn on good pasture."

"Feed all they will eat of either slop or whole grain."

"Feed corn and grass."

"Feed soaked corn and grass."

"If they are not doing well, I feed in a creep on corn and a slop of milk and scraps."

"Feed corn, shipstuff and bran on pasture."

"Feed corn and sweet slop."

"Feed corn and ground wheat."

"Feed a little ground corn as slop on a good clover pasture."

"Feed slop from house on good bluegrass and clover pasture."

"Slop them at least once daily, and give enough corn to keep them in fair flesh with lots of grass. Mix the slop and let stand twelve hours. Feed the corn in the ear."

"Feed shorts, corn and skim milk on pasture."

"Feed corn and grass."

"Feed shorts and oilmeal, soaked from one feed to the next, but fed sweet."

"Feed a little whole corn and let run on pasture."

"Feed corn on clover pasture."

"Same, but add some meat meal dry in the trough."

"Give them the run of a clover or rape field, and continue the ration of shipstuff, but add a light feed of corn."

The feeding of the fall pigs is so nearly identical in every respect with the replies given for feeding spring pigs that the replies on that subject will not be discussed separately from spring pigs. It is noted that a large majority of the replies given the feeds consist very largely of some soft feeds, which develop the pigs more rapidly than dryer feed. For pigs of this age nothing gives better results than skimmed milk, especially if fed with some kind of grain. A trial of different grains fed with skimmed milk for young pigs is reported in Bulletin 220 of Cornell University, where weanling pigs were fed for 98 days in dry lots, two lots in each test, with the following results:

Ration.	Initial weight.	Average daily gain.	Milk per lb. gain.	Grain per lb. gain.	Lbs. of milk per lb. grain.
Skimmed milk and corn meal	61.	1.01	9.6	2.8	3.4
Skimmed milk and corn meal	42.4	.96	8.8	2.4	3.6
Skimmed milk, corn meal and wheat middlings	24.7	.89	9.8	2.3	4.3
Skimmed milk, corn meal and wheat middlings	44.1	1.02	10.8	2.2	5.0

It will be noted that all the lots of pigs made very satisfactory gains, all the gains being near a pound daily per pig. The proportion of skimmed milk to grain was in no case, however, less than 3.4:1, which gives a very satisfactory ration. In case there is no milk to be secured, a ration of almost the same efficiency can be secured by a mixture of shorts and oilmeal or tankage and fed in a slop of warm water. The value of feeding more than corn alone to pigs of this age, unless on good pasture, is shown by a trial at the Wisconsin Experiment Station, reported in the Annual Report for 1904, where pigs, weighing 51 2-3 pounds, and being weaned in winter, were fed for 110 days on corn meal alone and on corn meal, middlings and skim milk and gave the following results:

Ration.	Gain per lot.	Grain eaten.		Milk.
		Corn meal.	Middlings.	
Corn meal	130	919		
Corn meal, middlings and skim milk in thin slop	362	541	647.2	231.9

It is seen from the above data that corn alone in dry lots is not a satisfactory ration for young pigs. It will be noted that when fed a mixed ration, the gains were increased more than 250 per cent. More than this, the author notes that the pigs receiving corn meal alone seemed to become stunted and not developed well. If corn is fed alone to young pigs it should certainly be in connection with some good pasture so as to give succulence and protein.

Aside from the actual food nutrients required, the necessity for an abundance of exercise and fresh air is best secured by the provision of a good clover, alfalfa or rape pasture. It is practically impossible to secure as good results from growing pigs without pasture as with it. Numerous trials have been made with fattening hogs, proving the high value of pasture for that class of hogs. How much more so must be the value of pasture to young and growing animals that are being grown rather than fattened, and that need an abundance of exercise!

TROUBLES OF THE YOUNG PIG.

The care of young pigs does not consist alone in giving feed that contains the proper nutrients. Anything that tends to injure the health of the pigs may lead to serious trouble. In reply to a question as to the most troublesome factor in raising young pigs, sixty-two replies were received, as follows:

Total replies	62
No serious trouble	13
Thumps	6
Lice	7
Worms	9
Scours	5
Large pigs robbing small ones	4
Saving at farrowing time	7
Sows eating pigs	1
Eating cockleburs	1
Bad weather	3
Cholera	4
Lack of exercise	1
Wolves	2
Wheezes	3
Losing pigs	1
Getting to grow	1
Coming at wrong time	1
Growing until 10 to 12 weeks old	1

It will be noted from the replies made that practically all the troubles are due to causes that can be remedied to a large extent by good care and judicious feeding. The provision of sanitary quarters and lots of sunshine and exercise will do more toward keeping pigs in good health than any other one thing. The nature of the last nine troubles are of such a nature, or of too indefinite a character, to be discussed in this bulletin. The others, however, can be discussed with profit.

Thumps.—This disease is generally due to the overloading of the stomach and lack of exercise. It may be due, however, to other causes, such as worms, etc., but in the great majority of cases is due to overfeeding in close quarters. We find that of the list of replies as to the prevention and cure of thumps, the farmers who are bothered with this disease are practically unanimous in curing it by limiting the feed and making the pigs take exercise. The majority of the correspondents report that they are not bothered much with this disease when the pigs are on grass. A good pasture is then the best preventive of thumps if the pigs are not too heavily fed. Of course, if the thumps are due to worms or other causes, the remedies for that cause must be applied. One man reports that he has never failed to cure thumps with from three to five drops of Verateum in sweet milk, three times daily. The most general remedy, however, is to find some way to induce or compel the pigs to exercise.

Scours.—This is a disease caused by bad feeding and unsanitary conditions about the pig's quarters. It may, however, be caused within the first few days after birth by the feverish condition of the sow affecting the character of the milk. Soured slops, mouldy corn, etc., fed either to the sow or to the pigs, may also cause scours. As this is a disease of feeding and sanitation more than anything else, the provision of clean quarters and good feed for both sow and pigs, is necessary. If the scours are due to fever in the sow, she should be given a dose of castor oil. We get from our replies the following means of curing it: "Change the feed." "Feed slack coal, some sulphur and coperas." "By careful care." "Don't know any very good remedy; giving the pigs a teaspoonful of alum water does some good." "Give soda, and in extreme cases give laudanum, white of egg and charcoal." First of all the error in feeding should be corrected and then if scours continue, a few drops of laudanum per pig, or one-half to one tablespoonful to the sow, should be given, and the dose repeated, if necessary.

Lice.—This is a pest that causes the pigs a great deal of annoyance, and often becomes so irritating as to cause them to become unthrifty. The louse is readily killed when the proper treatment is applied. It is more difficult to rid the sleeping quarters of lice than to kill them on the pigs, and as long as the houses are infected the pigs will soon have them again after being cleaned. The most general remedies for lice are crude oil, coal oil, crude petroleum, creolin and the coal tar dips, such as chloro-naptholeum, zenoleum, etc. These dips can be applied with a brush or broom or sprayed upon them, but these methods do not reach the inside of the pigs' legs well enough to be sure the lice are all dead. A sure way of reaching all parts of the animal is to immerse it in a tank containing a solution of dip, oil, etc. The ordinary dipping tank is 10 feet long on top and 5 feet long on the bottom, with one end perpendicular, thus leaving the other end sloping, with a cleated board upon it for the hogs to walk out. The width is 20 inches at the top and 8 inches at the bottom. With the top of this tank sunk to the level of the ground and chutes made to force the pigs over the perpendicular end, the dipping can be done very easily. The solution in the tank must be deep enough so that the hog is entirely covered when in the tank. When using coal oil for dipping, it should be used in the form of an emulsion made by dissolving one-half pound of soap in one gallon of hot soft water and then stirring in slowly two gallons of coal oil, until an emulsion is formed. The water must be stirred violently while the coal oil is being added, in order to form an emulsion. A gallon of this emulsion to ten to fifteen of water will kill the lice. For sprinkling and washing the hogs we find that a great number of our correspondents use pure coal oil and grease, but this is too strong for dipping purposes.

Another very handy method used for getting rid of lice is to put some dip or crude oil in the wallowing place and allow the hogs to wallow in it. Many men make a special wallowing hole of concrete or boards where the water can be kept cleaner than in a mud wallow. This method has given pretty general satisfaction.

After the hogs have been cleaned of lice the houses and sleeping quarters should also be sprayed or sprinkled with a disinfectant. Even then there will be eggs of the lice left that must be killed by spraying again in two or three weeks. It may be necessary even to dip the pigs again after two or three weeks in order to be free from the pest.

Worms.—The presence of worms in hogs has caused as much trouble and annoyance probably as any other ailment among hogs, except cholera. Very few herds are entirely free from them, and many are so badly infected that hog raising is not a profitable business. We find that in reply to the question as to the most troublesome factor in raising hogs, more mentioned worms than any other trouble. We find, however, that about one-seventh of our total number of correspondents report no trouble. The curing of hogs of worms is sometimes a very difficult task, in fact, four of our reporters say they cannot cure them.

In reply to the best way to prevent worms, we find that a very large per cent. of the replies are in favor of remedies that are general correctives for the system rather than actual remedies for worms, thus showing the value of having the pig's system in good condition in order to resist the attack of any disease. This list of general correctives is as follows:

Total number of replies	53
Salt and wood ashes	24
Coperas	9
Charcoal	4
Sulphur	5
Government formula	2
Coal	2

It is noted from the above list of replies that large numbers of farmers attribute the prevention of worms in their herds to the use of good general remedies rather than curing the worms after infection. Still others attribute the prevention of worms to the free use of alfalfa pasture or to the general use of linseed oilmeal. The use of these general remedies is especially to be recommended, especially the salt and ashes, charcoal, coperas, and sulphur, in order to help keep the digestive system of the pig in good working condition. Salt and wood ashes should be kept before them at all times. This serves to illustrate the value of good care and management, not only for worm prevention but for all other ailments.

We find the following remedies among the curative class of worm treatments:

Worm medicines	7
Turpentine	6
Concentrated lye	2
Coal oil	1
Crude carbolic acid or carboleum	1

The treatment that has given the most general satisfaction may be taken from an extract from Bulletin 100 of the Purdue University, which reads as follows: "To destroy the worms or drive them out of the intestines, a number of different drugs can be used. The simplest treatment for intestinal worms is turpentine in milk. The dose given is one teaspoonful of turpentine for every eighty or one hundred pounds of live weight, and is more effective if repeated three days in succession. A mixture of powdered areca nut and worm seed in teaspoonful doses is also recommended. Santonin five grains and calomel three grains, for every eighty pounds of live weight, is a very effective remedy for round worms. All powdered drugs are best given in ground feed, and should be mixed well with it, or each pig will not get the proper dose. In dosing a large number they should be divided into small bunches, and each bunch dosed separately. The best results are gotten when the pigs are starved for about twelve hours before giving the remedy, and when a physic is given along with it or immediately after. Castor oil or calomel are the physics usually given, especially the latter, as it is very effective, and can be readinly given along with powdered drugs. Turpentine need not be followed by a purgative."

As young pigs often become infected by eating the worms passed from the older hogs, the sow should be treated for worms before the pigs are large enough to eat, preferably while the pigs are only a few days old.

Robbing.—The trouble occasioned by the larger pigs robbing the smaller ones is best overcome by the separation of pigs of different ages. The four farmers most troubled from this cause give the following remedies: "Separate each sow with her litter," "Have small pastures and keep the different ages in different pastures," "I always keep the younger pigs separated from the older ones until they are large enough to take care of themselves," "I have the sows farrow at about the same time and keep them separated."

Cockleburs.—The cocklebur, when coming through the ground, and until it reaches a few inches of height, is poisonous to hogs. The pigs, when not supplied with other green feed, often eat them and are poisoned thereby. Pigs should be kept from land infested with cockleburs while the weed is small.

ORNAMENTAL PLANTING FOR THE FARM HOME.

(By J. C. Whitten, Professor of Horticulture, University of Missouri.)

Of all places the farm home possesses the greatest opportunity for beautiful effects in ornamental planting. As a rule this fact is not sufficiently appreciated. In many cases, practically no attention whatever is given to planting about the home. One reason for this frequent neglect is the fact that the owner is under the impression that good landscape gardening about his place can not be effected without elaborate plan and large expense. This is a mistake, for as a matter of fact, it very frequently happens that nature herself has given to the country home all of the main essentials of landscape beauty.

Practically any farmer could make the grounds about his home a thing of beauty with no greater expense than a little effort now and then on the part of his family. The results so obtained in a few years would grow into an effect which would make the farm not only a better place to live, but worth more on the market.

The first essential is to make use of the natural beauty which the place already possesses. The country home is usually surrounded by broad, natural landscape across which there are beautiful natural views. In many cases, almost no planting at all is necessary.

It frequently happens that the main problem lies in opening up vistas so one can see out over the surrounding landscape. In a wooded country a beautiful view may be opened up by cutting out a few trees in order to allow the eye to range across adjacent valleys or distant hills. Not infrequently a fence row continuously over-grown with trees and bushes may obstruct some beautiful distant scene. An opening cleared in such an obstruction may give a vista through, so as to bring into view from the house, hills, valleys or green pastures which make up the surrounding landscape.

Occasionally the low growing limbs of a few shade or forest trees may obstruct a view of cultivated fields or green pastures. In such a case it may be desirable to prune off some of these lower limbs in order to open up an attractive scene.

Land which is used for pasture, when cleared, should have occasional groups of shade trees left here and there. This not only gives grateful shade to live stock in the heat of a summer day or shelter from the winds in bleak places, but it makes the surrounding country more beautiful. In selecting these trees to remain standing, valuable species should be considered. Often nut trees are cut down, which, if allowed to stand would supply nuts for the family or even for market. Species like the oak, hickory or black walnut, which contain valuable timber, may be allowed to grow and the older specimens harvested for timber when they have reached full maturity. In one pasture known to the writer, more than $100 worth of such timber was taken out in a single year by removing only such mature trees as could be spared without destroying the

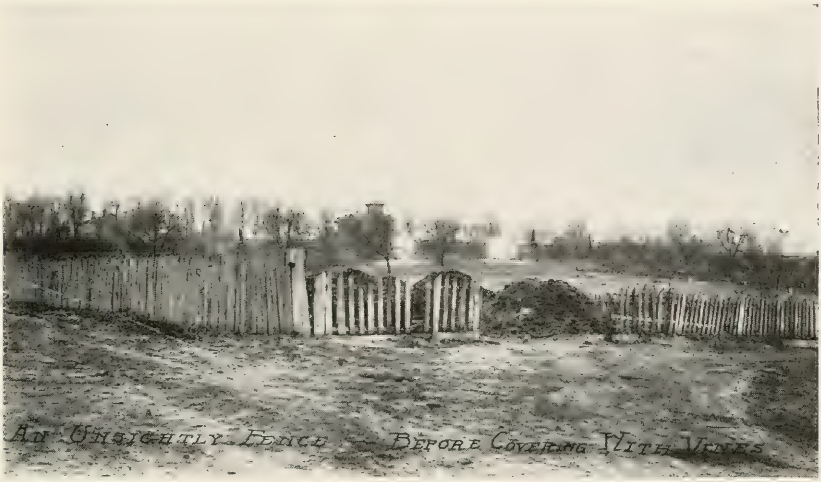

Figure 1—Unsightly backyard fence.

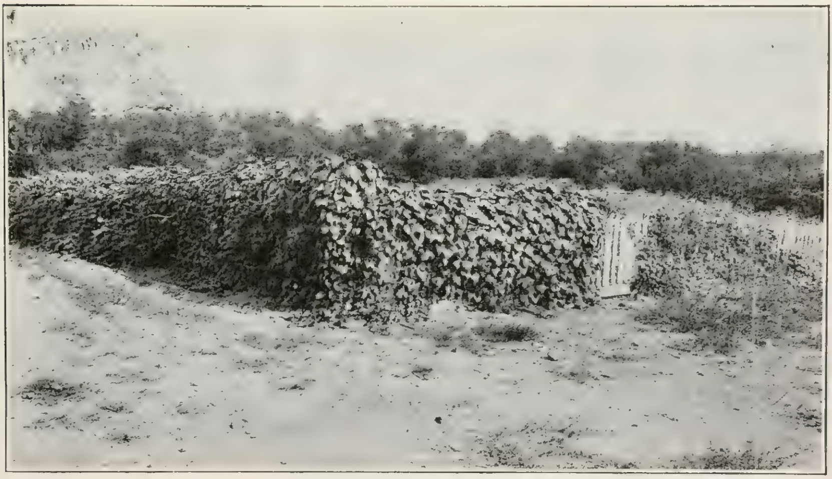

Figure 2—Five cents worth of seeds of Annual Vines furnished cover for fence seen in Figure 1.

shade or the landscape effect. If brushy pastures are mowed once or twice a year with a mowing machine their unsightly weeds may be removed and a green blue grass cover encouraged in place of the unsightly brush. This has an economic value as well, for not infrequently enough more grass can be secured to more than pay for such mowing.

In addition to thus securing views of the broad surrounding landscape, some individual planting may be done immediately about the buildings. The first thing to do is to clean up the place. This may consist in placing the wood pile in some inconspicuous place in the rear; gathering together scattered machinery and getting it under protection; defining the drive so the traffic will be confined to a given entrance-way rather than driving promiscuously about the place. In addition to this, inexpensive planting may help to screen away certain unsightly objects, especially in the rear. A back fence behind the place may be covered with vines; the wood pile or chicken house may be sheltered from direct view of the road by massing shrubbery in front of it. A screen of vines may protect the unsightly wood pile from direct view; the feeding lot or chicken yard may be screened off by a planting of grape vines which in addition to their cover as a screen, may furnish fruit for the family.

A main essential is to secure a green grass lawn before the house. Next to securing a good sod, it is essential that the lawn should have an open center. It should never be broken up by scattered and promiscuous flower beds or isolated shrubs. A green, open, sunlit lawn suggests restfulness and quiet, while scattered shrubs or flower beds produce an idea of fidget and distraction.

In placing shade trees it is desirable to use a row of them along the road; others may be grouped in curves of the drive-way or about the borders or in the rear of the home grounds. Enough may be grouped about the house to give necessary shade to hot sunny porches or south windows. Native forest trees may be used, where desired. Fruit trees often may be planted about the poultry runs or feeding lot in order to take away their barrenness and offer inviting shade.

Shrubs should, for the most part, be massed about the borders of the home grounds, or in the rear. Occasional low masses of them may be placed at the angles of drives or walks.

Vines frequently may be used to good advantage over porches to keep out the hot sun, or as previously described, to screen away back fences or unsightly objects.

For road-ways there are probably no better shade trees than the native elm, sugar maple or oak. Native species are already acclimatized and at home, hence they grow well. They are in keeping with our natural surroundings.

Among our native shrubs, the dogwood, wild crab apple, various species of hawthorn or thorntree, silver bells, buckbush, red bud, elderberry or sumach are good. Aside from these native shrubs, if desired, one may employ the old-time lilac, snowballs, syringa, spirea, weigela or hydrangea.

Among native vines, the trumpet-creeper, five-leaf ivy or Virginia creeper, and even wild grapes may be used.

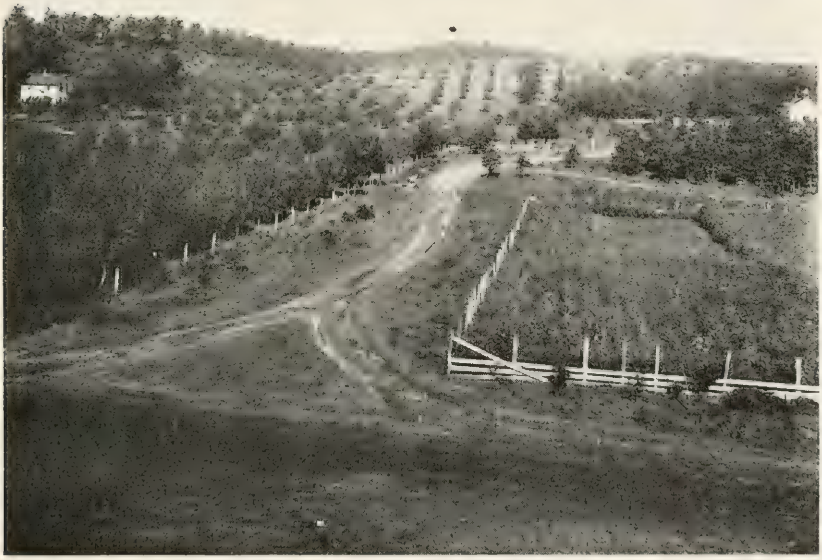

Figure 3—Beautiful distant natural views from farm houses where but little other planting is needed.

If small flowering plants are used, it is better to plant them at the outer edge of sheltered borders than to put them in isolated beds. The peony, iris, lilies, hyacinths, and other perennial forms are desirable and they require but little annual care. One may add to such home plants year by year by bringing in handsome plants from the wild. When one once begins looking for ornamental plants in the woods or along the creek banks, it is surprising how many beautiful species are brought to our notice that had never before held our attention. Planted out about the home where they are removed from their struggle for existence, they take on an added beauty so we would hardly recognize them as wild plants. Not infrequently a visitor will ask, "What beautiful shrub is this?'' without recognizing it as a wild species which he has tramped over in the woods all of his life time.

All this puts us more in love with the home. It gives us a greater pride in living, and it thereby makes farm life worth the living. It furthermore brings us into a better understanding of and love for our native plants and enriches our capacity of enjoyment of country surroundings.

SOME PRACTICAL DETAILS.

While the foregoing suggestions may be helpful in originating an artistic plan for the home grounds, it is desirable to consider some practical details in carrying out the actual work.

Grading the Home Grounds is one of the first operations, provided the surface is not already in shape for immediate planting. No more grading should be done than is absolutely necessary to accomplish the following two things:

First. Proper drainage away from the buildings, drives and walks.

Second. To get a smooth surface that can be mowed.

Ordinarily, around the farm home it is best to leave in the main, the natural contours. It is not necessary to take off all high places or fill in all low ones. Natural slopes are better. Small holes and little knolls, however, should be graded so as to get such a surface that a mowing machine can easily be run over the place.

It is desirable to have the earth high enough about the foundations of the buildings so the water will drain away from them. Roads and walks should be just high enough above their surroundings so they will drain. If not well drained, roads and walks will cut up in wet weather or early in the spring when the frost is going out. However, if good drainage is afforded them, they will generally stand firm at all times of the year.

While natural contours may, for the most part, be left as they are, it is best to have higher and lower areas join each other in natural, easy lines, rather than in sharp angles. A necessary embankment, for example, should not be graded as a sharp angle at the top or join a lower area with a sharp angle at the base. These angles should be rounded off so one contour joins another gradually with an easy slope, so no one can draw a definite line where one area leaves off and another begins.

Grading should never be done when the ground is wet, as this puddles the soil so it will be lumpy, hard and crusty. For this reason the autumn is the better time to do the grading. Grading, however, may be done in spring, provided the soil is dry enough.

Where ground is to be graded, it is best wherever possible to pile up enough of the surface soil so it can be spread over the surface of the bare clay when the grading is finished. If the grading is done in the fall, a dressing of fresh, strawy, stable manure should be given throughout the winter to prevent the soil from washing.

Seeding the lawn is best done in early spring. The seed may be sown along with the last snows and allowed to be carried into the soil by the melting snow. It is safest, however, to seed two or three times in a single spring. Dry weather may follow the first seeding and dry out and kill the young grass before it has time to get a start. If three successive sowings are made, moist weather is almost sure to follow some one of them, so the grass will become established before a drought sets in. Seeding that is done after the last snows should be followed by a very light harrowing, raking, or brushing of the soil so as barely to cover the lawn grass seed.

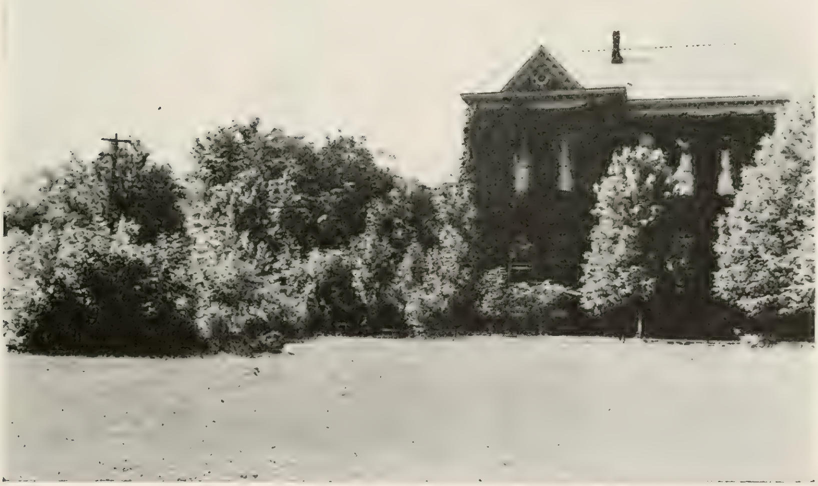

Figure 4—Open lawn in front with effective massing at sides and rear of building.

A dressing of fresh, strawy, stable manure on spring sown lawns is helpful. It prevents washing of the soil, keeps the seed from drying out, helps prevent crusting and baking of the soil and furnishes ready plant food for the young grass.

Furthermore, stable manure usually contains much grass seed. Such seed usually germinates very promptly, as the digestive juice of the animals and the compounds in the stable manure fit the seed for prompt germination.

As soon as the grass is well up, the coarse manure may be raked off, leaving the lawn smooth for subsequent mowing. If weeds begin to get the start of the grass the lawn should be mowed at frequent intervals to allow the grass to come through. Furthermore, clipping back the grass tends to make it bushy at the roots and make a compact sod. If the grass is allowed to grow at will the first summer, it tends to shade out the roots, form in bunches, and give a very uneven sod.

On small lawns it is best to keep the grass mowed with a lawn mower each year. On large lawns it may be mowed only once or twice during the season. Nothing is handsomer for extensive farm grounds than waving blue grass.

Choosing the kind of grass to sow is an important factor. In general, there is no better lawn grass for Missouri than blue grass. It is at home here and reaches beautiful development in most soils. It makes a compact, uniform sod. It will even stand a great deal of tramping when pastured to animals on large areas. It helps to keep down spreading bushes and noxious weeds, once a good sod is secured. Except on lawns that are largely shaded by trees, it is our best lawn grass.

On very shady lawns English rye grass is perhaps the best species. It does well only in shade. It will thrive well in localities too densely shaded by trees for the blue grass. On the north side of buildings where blue grass will not grow, ordinarily, the English rye grass will reach splendid perfection.

On slopes that wash badly, red top is one of the best species to hold the soil in place. It is a coarse, strong grower and will often hold the soil where the blue grass or English rye grass would be entirely washed away. Sometimes it may be grown as a temporary covering when blue grass sowed with it may take its place by naturally crowding out the red top after the sod is established.

Whatever species of grass is to be sowed, it is well to sow some clover seed with it. White clover is the best lawn plant among all the clovers, as it is small, low and compact, lends itself well to frequent mowings, makes a beautiful carpet when in bloom, and propagates by runners so it will spread quickly over the bare areas between the plants. White clover seed, however, is very expensive and usually should be used in only limited quantities, except on areas so small that expense need not be taken into account.

Common red clover, especially on large areas is an excellent nurse plant for lawn grass. Either species of clover sowed with lawn grass is likely to take hold of spots where bare clay is so tenacious that the grasses themselves can not immediately find a foot-hold.

The clovers will in a few seasons mellow and ameliorate even a hard clay so the lawn grasses will eventually come in and take their place. The clovers will make a fair lawn cover on a hard clay soil until they finally prepare the area for the growth of the finer grasses.

In making the lawn, the owner is usually troubled the first year or two with the question of what to do with noxious weeds such as dock, dandelion, etc. For the most part, these weeds will disappear as fast as the soil is well fitted to grow grasses. It may be desirable, however, to dig out here and there the largest docks, burdocks or thistles. In the main, however, the weeds soon give way if the lawn is frequently mowed, and the grass will eventually cover the areas, especially if stable manure is used as a winter dressing until the soil becomes rich enough to support a good growth of grass.

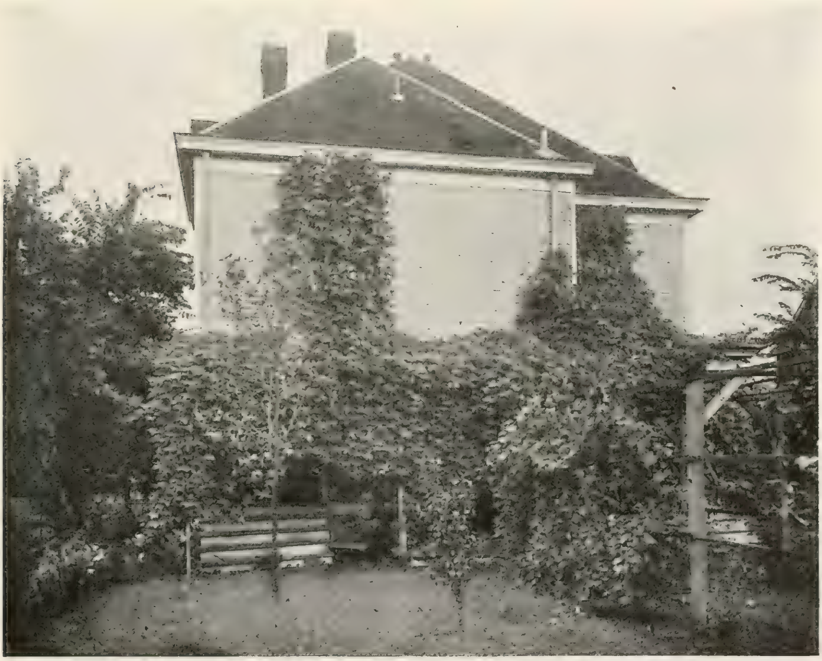

Figure 5—Good use of vines, trees and shrubs, with bit of green lawn.

Shade trees may be planted either in fall or spring. In fact it may be done at any time in the year after the leaves are off in the fall, and before they leave out again in spring, whenever the ground is not frozen, and when the soil is not wet enough to bake, plaster and harden when worked.

If the autumn is excessively dry, so the trees are likely to dry out during fall and winter, it is best to delay planting until spring. Perfectly hardy species, however, if planted as soon as the leaves are off in the fall, will make some root growth and become well established before winter sets in, and be ready for a vigorous growth in spring. Autumn planted trees should be mulched about their roots with straw or manure throughout the winter.

The tendency of beginners is to set such trees too deep in the ground. In very dry sandy soils they may be set a little deeper than they grew in the woods or nursery. In heavy clay loam, however, they should be planted just about the depth at which they grow naturally.

In planting, the tops of the trees should be cut back considerably to balance the cut back root system. In cutting back, it is best generally to leave a central leader or trunk as far as possible. In shortening side branches, it is best to cut back to a side twig, so the part of the limb which is left will be terminated by a growing point.

Evergreen trees, including pine, spruce, fir, cedar and the like, are best, however, transplanted just as they are beginning their new growth in spring. In moving the evergreens, it should be borne in mind that their roots will not stand being exposed to the drying influence of the air even for a few minutes. Small evergreens should have their roots plunged in a tub of water as soon as they are dug up, and kept in water until they are planted in their permanent position.

In setting any kind of trees the earth should be tramped very firmly about the roots as fast as it is shaken in with the shovel. The last inch of soil at the top should be left loose, however, so the soil will not bake about the tree.

Planting ornamental shrubbery is based in each respect upon the same principles as planting ornamental shade trees. This applies to season of planting, method of pruning, handling and all other factors.

Pruning trees and shrubs. As a rule trees and shrubs should be pruned from year to year so as to allow them to take their own natural form or habit. Ordinarily it is not best to clip trees into low or compact forms by annually clipping them back or shearing the outer surfaces.

Most of the pruning should be done in winter but when the wood is not severely frozen. Dead or dying limbs should be cut out at any time, however. Where it is desired to secure long trunks so one may see out under the trees, the lower limbs may be cut out from year to year as the tree reaches upward in height. Wherever the limb is cut, however, it should be cut close to the trunk of the tree so the growing layer may easily close over the wound. If even a short stub or knot is left, this knot will die and the wound can not close over. Wounds will perhaps heal more readily if the limbs are cut just at the time growth is beginning in spring. This gives but a brief period for pruning and where many trees are to be pruned, the work may be done in winter when other farm work is not pressing.

It is not well to remove very much of the leaf surface of the tree by pruning in mid-summer. This stunts the growth of the tree.

Severely cutting back or dehorning rapidly growing trees like the water maple is a mistake. This is frequently done on the supposition that such trees will break down if their limbs are allowed to get long and heavy. However, ''breaking down'' may be alleviated by shaping the tree from the beginning so it will make a straight, upward, central trunk rather than forming forks. Any tree which has opposite buds like the maple is liable to form forks when the terminal bud at the growing tip dies in winter. Such a fork may be corrected the first winter after it forms, by cutting off one side of the fork, allowing the other

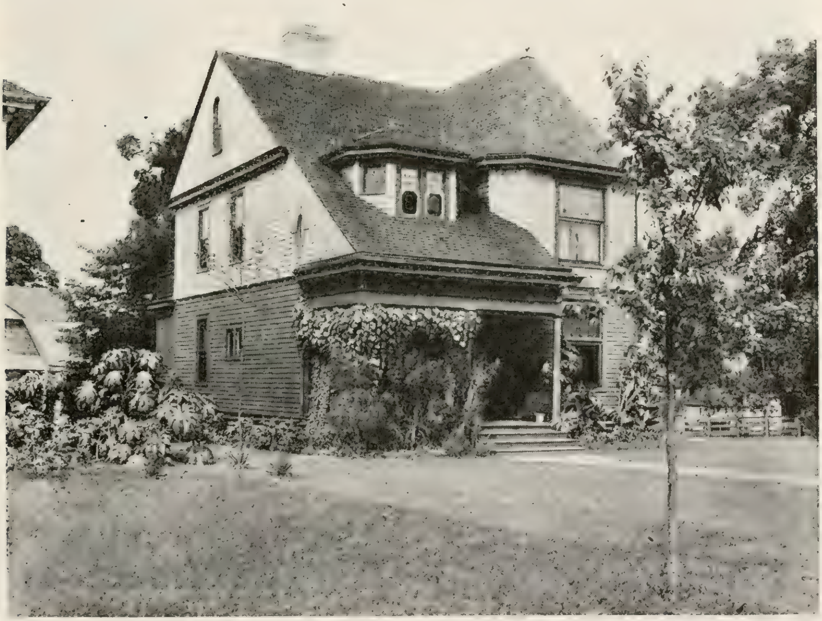

Figure 6—Open lawn and effective planting.

side to straighten up and become the leader or main trunk of the tree. If cutting close to the trunk in removing one side of the fork is likely to leave too large a wound, the young stub thus cut may be left from four to six inches long so as to contain a few buds. These buds will push out as side branches rather than replacing the fork.

Cutting back or dehorning a tree tends to make it form objectionable forks from the old stubs which are left. Furthermore, these old stubs will rot more or less, making weak points of attachment where the new limbs form, so that the ''breaking down'' process will, in the long run, be worse rather than relieved.

Vines to be secured for the home depend upon the character of the house. If the house is of brick or stone, vines may be planted against the base so they will cover the blank area of the walls of the whole house, or as much of it as is desired. It is at least desirable to grow vines about the doorways or at the corners of the house, at the angles, over the outside chimneys, or in large blank areas between the windows.

The best vine for this perhaps is the Virginia creeper, sometimes also known as woodbine or five-leaf ivy, but botanically known in catalogs as Amelopsis quinquefolia. This vine has disc tendrils and clings well to brick or stone walls. It should not be grown on the walls of wooden houses, as it will injure the wood.

The question is often asked whether it will injure stone or brick walls. It is beneficial rather than injurious to brick or stone houses. It shades the walls, keeping the rooms cooler in summer. Chipping of brick or stone is largely due to alternately heating up by the sun and cooling off at night. The shade of the vines prevents this alternate heating and cooling. The roots of vines remove a large quantity of water from the soil around the base of the building, which tends to keep the basement freer from water seepage and opposes uneven settling of the house wall.

The native trumpet creeper is a splendid vine for back fences, or it is a good screen for out-buildings.

For porches the various honey-suckles are among the best. These vines are best trained to wires run vertically along the porch front about one foot apart. Such wires may be attached to screw eyes placed in the frame work of the porch above and below. The mistake is frequently made of using wire screen or fencing on the porch for vines. This prevents reaching through the wire to properly prune the vines. If wires are placed one foot apart, the side branches of the vines will form a sufficiently dense growth across the openings and make a complete cover.

Every spring the vines should be pruned so as to leave a few main stems along the wire. The stubs of side branches should be only a few inches long. With early spring a rapid new growth of branches forms so as to give a clean perfectly green cover throughout the season. If woven wire is used so pruning can not be done, many of the inner branches will be shaded off from year to year and the vines become filled with dead and dying wood.

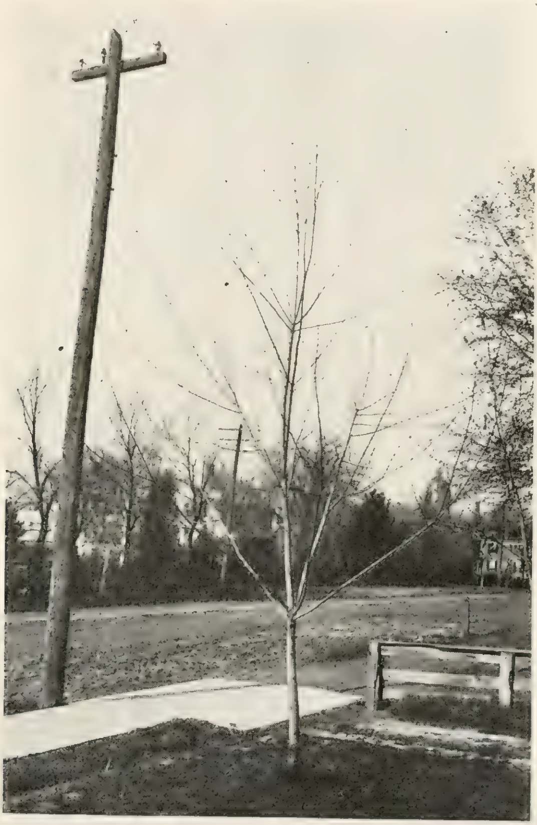

Figure 7—Soft maple tree, trained with straight central trunk, so it will not break down.

CEMENT FOR THE FARM AND FARM HOME.

(By Curtis Hill, State Highway Engineer of Missouri.)

DEFINITION OF TERMS USED.

Concrete.—An artificial stone made of cement, sand and some third material.

Mortar.—A mixture of sand and cement.

Aggregate.—The crushed rock, gravel or other stone used as the third material of a concrete mixture.

Mixture.—The mixing together of the mortar and aggregate for concrete.

Voids.—The open spaces, pores, or interstices between the different particles of concrete materials.

Tamping and ramming.—The pounding of concrete to form a compact mass by forcing the particles closer together and reducing the voids.

Setting.—The crystallization or the chemical action of cement when in contact with moisture Cement should develop the initial set in not less than 30 minutes and a hard set in not more than 10 hours.

Crazing.—The checking or cracking, as the fine hair cracks, on the surface of stone, concrete, etc.

Wearing surface.—The outer surface of the concrete where subject to wear or to atmospheric actions, usually covered with a thin coating or wash.

Molds or forms.—The framework and falsework erected to keep the concrete in place till it sets.

Green concrete.—Concrete which has not hardened or set.

Rich Mixture.—Concrete with a large proportion of cement, as a proportion of 1 cement, 2 sand, 4 aggregate.

Medium Mixture.—Concrete with a less proportion of cement, as a 1-3-6.

Lean Mixture.—Concrete with still less proportion of cement, as a proportion of 1-4-8 or 1-5-10.

Reinforcement—The use of steel or iron in concrete to increase the tensile strength.

Grout.—A thin mixture of water, sand and cement. To fill the spaces between stones with cement grout.

Hydraulic Properties.—That property of cement which, when moisture is added, causes it to set and harden.

Plain Concrete—Concrete without reinforcement.

Tensile Strength.—The adhesive power—the resistance to being pulled apart.

Compressive Strength.—The power to resist pressure or to prevent being crushed.

Waterproofing.—The power to resist the absorption of moisture—to be made impervious to water.

Core.—The form used to make the hollowed out portion of a concrete article—as the hollow of a concrete block.

Foundation or Subgrade.—The formation upon which the structure rests, either natural or artificial.

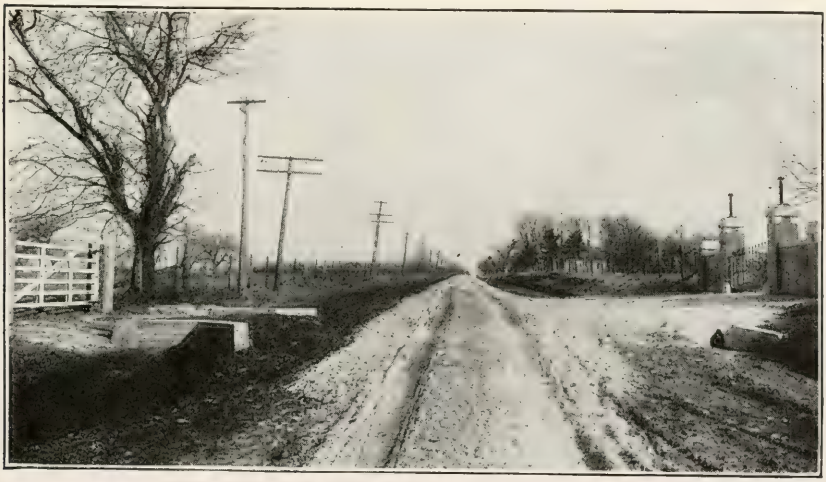

Figure 1. View near Springfield, Mo. Rock road completed as far as the two entrances, one on either side. The entrance on the left, with concrete gate posts, is the Holland Stock Farm; on the right, brick and native stone, is the property and home of Paul Nicholas. Concrete culverts are built over the drain ditches on both sides of the road. These kind of permanent improvements speak volumes for prosperity in Missouri.

Footing Course.—A broadening and flattening at the foot of the foundation wall in order to give a broader bearing upon the soil.

Base or Subfoundation.—The first course of material placed in the excavation for floors and sidewalks.

Spaces or Centers.—The distance apart between centers of objects—as the spacing of concrete beams is the measurement from the center of one beam to the center of the next one.

Radius.—One-half the diameter of a circle—used in making circular concrete forms.

Circumference.—The outer rim of a circle.

Monolith or Solid.—Built as "one stone." A single piece of work, as a solid wall or a porch floor made in one slab.

Hollow Wall.—Two thin concrete walls tied together with concrete piers or steel rods or bars at regular intervals.

Hollow Block.—A concrete block containing a hollow or open space through one way of the block, used for building purposes.

One use for concrete in construction of country road bridges. Concrete flooring and abutments insuring substantial and lasting bridges.

Stucco.—A cement mixture or concrete applied over a surface (commonly as a mortar applied over rough stone, brick or metal lath.)

Pebble Stone Finish.—Stucco work finished by spreading small pebbles over the green surface.

Bush-Hammered.—Solid concrete surface "picked" over with a specially made hammer, called a bush-hammer, for the purpose of giving the surface the appearance of a rough finish.

CEMENT.

Kinds—Cement is of three kinds, Natural, Puzzolan and Portland. The Natural and Portland cements are usually found on the markets in Missouri. Natural Cement is cheaper, weighs less and is not so strong nor so reliable as Portland. Cements are often spoken of and sold in barrels. In this treatment, however, they will be discussed in bags or sacks. A bag of Western Natural cement weighs from 85 to 90 pounds; Eastern Natural, about 100 pounds. A bag of Portland Cement weighs 94 pounds, and in mixing it it is safe to assume one (1) cubic foot per bag. Poor cement is dear at any price. Cement is the binding material of the concrete, and a poor cement means a poor structure. On all works of magnitude the cement should be tested after it is brought upon the work, but a test requirement is impractical, and usually unimportant where cement is applied to farm uses. The purchaser must, therefore, rely upon the retailer to give him a *good reliable Portland cement of a standard brand.*

Manufacture—Natural cement is produced by calcimining rock from certain localities which contain, without the mixture of any material, such elements as will produce a cement having hydraulic properties. Puzzolan cement is made of lime and iron slag.

In the production of Portland cement certain raw materials are crushed and dried, then mixed in the proper proportion, as determined by chemical analysis, after which they are pulverized and intimately mixed. The resultant is then fed into the upper end of a rotary kiln (a long inclined cylinder, from 60 to 125 feet in length), which rotates slowly. This resultant is subjected to intense heat during its journey from the upper to the lower end of the kiln, passing out at the lower end a thoroughly calcined and burned clinker. This clinker is then ground to a very fine powder (the fineness of the grinding, to some extent, determining the strength of the cement) and forms what is known as Portland cement.

Brief History—Ruins illustrate the use of lime and cements by the ancients. Especially is this true of the Romans, who, it is supposed, used a Puzzolan cement made from a volcanic material or dust. The Egyptians used a lava that contained hydraulic properties as a cement. The Incas of Peru used a similar cement, and evidences of the ancient uses of cement are found in Spain. It was not until the dawn of the 19th century that the brains of England and France produced, almost simultaneously, an artificial hydraulic cement, the beginning of the present great cement industry of the world. A material was found which, when calcined, was given the name of Roman cement. An English patent and specifications for producing an artificial stone, by Aspdin in 1824, is the first scientific description of an artificial Portland cement. Pasely, another Englishmen, however, left writings in 1820 describing this same process.

The title "Portland" was derived from the color, "a pleasing, grayish white" building stone, used extensively in England at one time. The stone is from the south coast of England, where a limestone of a "grayish white color juts out into the ocean and is known as the 'Bill of Portland.' " An English manufacturer produced a cement of which a most noticeable difference between it and the Roman cement of that day was the color. The color of the new product closely resembling that of the stone from the "Bill of Portland," it was called "Portland cement."

Among the cement pioneers in the United States the two most noted and successful ones are D. O. Saylor of Coplay, Penn., and Thomas Millen of South Bend, Indiana. These two men, working independently and unknown to each other, found the material and a process and established small kilns for the production of Portland cement in and immediately following the year 1871. This was the beginning of one of the greatest industries of this country.

Cement Industry in U. S.—Statistics of the cement production in the United States show it to be one of the great industries of the country. While there is a marked decrease in the value of this production in 1908 as compared with that of 1907, there is an increase in production. The following amounts of production are given in barrels—four bags to the barrel of Portland, three of Natural.

CEMENT PRODUCTS AND VALUES IN U. S.

Year.	Kind.	Barrels.	Value.
1878.			
Imports	All kinds	92,000	
1880.			
Production	Portland	42,000	$126,000 00
1907.			
Production	All kinds	52,230,342	$55,903,851 00
Imports	"	2,006,228	2,637,424 00
Exports	"	900,550	1,450,841 00
Consumption	"	53,336,020	57,090,434 00
1908.			
Production	All kinds	52,910,925	$44,477,653 00
Production	Portland	51,072,912	43,547,679 00
Imports	All kinds	842,121	

The average price of cement in 1880 was $3.00 per barrel (75 cents per bag); in 1907, $1.10 per barrel (27½ cents per bag); in 1908, $0.85 per barrel (21¼ cents per bag) at the mills.

CEMENT CONCRETE.

Composition—Cement concrete is composed of a mixture of cement, sand and a third material, usually rock or gravel. It is composed of two parts, namely: Mortar, a mixture of sand and cement, and the aggregate, a course material (rock or gravel). These two parts, mortar and the aggregate, compose the mixture, commonly called concrete.

To many people this appears to be simply a mixture of cement, sand and stone, mixed together in any way or proportion to suit the individual fancy of the user. This is not a fact, for there is a definite, well defined theory involved in proportioning concrete.

A correctly proportioned mortar is one which contains enough cement to perfectly coat every particle of sand and completely fill all voids. The mortar in turn should coat every particle and fill every void of the aggregate. As a matter of fact, this condition is never exactly obtained in practice, but it follows without argument that the materials must be thoroughly mixed, and that a thoroughly mixed lean concrete is stronger than a richer proportion poorly mixed.

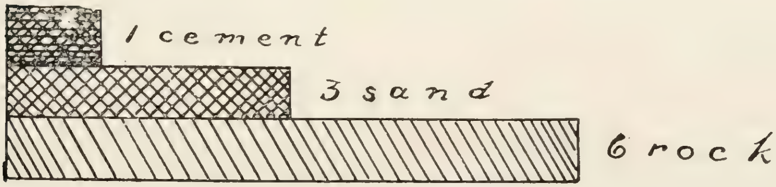

Figure 2. Illustrating the proportions of a 1-3-6 concrete.

Concrete is usually a 1-2-4, 1-2½-5, 1-3-6 or 1-4-8 mixture, meaning that a 1-3-6, for example, contains 1 part cement, 3 parts sand and 6 parts broken stone or gravel, all parts by volume. Fig. No. 2. As for example, if 1 cubic foot of cement (one bag) is used, there is required 3 cubic feet of sand, 6 cubic feet of stone. About 40 cubic feet of these ingredients, each measured to itself, will make one cubic yard (27 cubic feet) of tamped concrete.

These proportions roughly approximate the voids in the sand and aggregate (stone). The accurate way is to measure the voids in sand and stone, and proportion the mixture to perfectly fill them. An easy method of determining the amount of voids is to fill a vessel of known volume with the material under examination, then pour in water till the vessel is full, taking note of the amount of water. The volume of water, divided by the volume of the material, will give the percentage of voids.

Materials for 1 cubic yard of concrete, in place; sand voids, 35 per cent; rock voids, 45 per cent.

Proportion.	Cement bags.	Sand cubic feet.	Stone or gravel cubic feet.
1–2–4	6.00	12.00	24.00
1–2½–5	5.04	12.55	25.10
1–3–6	4.32	12.96	25.82
1–4–8	3.40	13.51	27.02

(Weight of concrete is about 150 pounds per cubic foot.)

Table of safe working strength of Portland cement concrete in direct compression (factor ⅓).

Proportion.	Pounds per square inch.
1–2–4	500
1–2½–5	450
1–3–6	400
1–4–8	350

(For a vibrating or pounding load take one-half; for tensile strength, use one-tenth; for shearing value assume 60 pounds per square inch).

Sand and Mortar—The sand should be reasonably clean, sharp (angular, not round and smooth) and coarse. Any foreign substance of an organic or decaying nature is detrimental beyond a doubt. Any loam or matter adhering to the particles of sand will prevent the close contact and adhesion of the cement as well as the different particles of sand. Also more cement is necessary to produce a mortar of a given strength with fine than with coarse sand.

The weight of good mortar sand varies with the amount of water it carries, but is usually considered as about 2,500 pounds per cubic yard. The voids are 30 to 40 per cent, depending upon the character of the sand.

Aggregate—Rock and gravel are the most commonly used materials for the aggregate. There is little choice between a good hard rock and a good clean gravel. Chats (tailings from the lead and zinc mines) is an excellent concrete material. For floors of buildings and where little weight is desired, cinder concrete is sometimes used. The strength of cinder concrete is about one-half that of rock or gravel concrete. A general order for the relative strength of concrete materials is 1, trap; 2, granite; 3, gravel; 4, marble; 5, limestone; 6, slag; 7, sandstone; 8, slate; 9, shale; 10, cinders.

For thin walls or in reinforced work, the size of the particles (rock or gravel), in the aggregate should not exceed one (1) inch—from ¼ to 1 inch is a good regulation, depending somewhat upon conditions. For concrete, where mass or weight, such as heavy foundations, dams, retaining walls, etc., are desired, pieces up to 2 or 3 inches on the greatest dimension may be used. Stone 6 to 12 inches across may be embedded in plain concrete for very heavy foundations or walls—these pieces thrown bodily into the concrete is termed a "one-man" concrete. They must be completely embedded in the concrete.

The weight of gravel or limestone, broken to concrete size, is approximately 2,500 pounds per cubic yard. The voids in gravel are from 35 to 45 per cent; in broken limestone, screened, 48 to 50 per cent; limestone, crusher run, 40 per cent.

Mixing—All ingredients, cement, sand, rock and water should be practically clean. The cement and sand should first be thoroughly mixed dry upon a suitable and water-tight platform and the stone or gravel then added. In dry hot weather, the broken stone or gravel should be dampened before being added. When the mortar is prepared the stone is spread upon it and the whole turned with shovels at least three (3) times—and worked rapidly. A sufficient amount of water is added before and during the mixing to produce the proper consistency.

Enough water is required to make a pasty mixture. Reinforced concrete requires a wetter mix than plain concrete. A wet mix, not sloppy, for many kinds of concrete, is as good, or better, than a dry mix, and will need less tamping, but takes longer to set. Never use enough water to wash the cement and sand away from the stone.

In freezing weather the sand, rock and water should be warmed, but not hot enough to burn and injure the cement. If the concrete is then protected from the frost, there is but little danger of damage from the cold. It is one practice to make a salt solution of the water in cold weather, using one part of salt to every 10 parts of water, to prevent freezing. It is well, however, not to mix concrete in freezing weather when possible to avoid it.

Placing—The concrete should be deposited in place as soon as it is mixed. Cement takes its initial set in a few minutes after water is added to it, and should not be disturbed, else the annealing process is broken and the concrete weakened. It can be injured by too great a drop, 5 or 6 ft., which separates the cement from the aggregate. Deposit the concrete in layers not to exceed 6 or 8 inches and slightly tamp it until the water rises to the top and the body will slightly quake.

To get a good finish on the face of concrete, run a shovel or a garden hoe, bent in a direct line with the handle, down between each layer of concrete and the form, pull the concrete out slightly and pour a 1 to 3 mortar into the space and then tamp thoroughly back into place. If a particular good finish is desired, plaster the forms just ahead of the concrete with a 1 to 3 or a 1 to 2 mortar. Thoroughly spading and working the concrete next to the molds as it is placed will produce a reasonably good but not always a smooth finish. A good finish may be obtained on solid concrete by dressing off the rougher edges by hand and then rubbing down the surface with carborundum blocks, after which wash with cement paint—a thin solution of water and cement.

Where concrete is left unfinished until it has set, or over night, the unfinished parts must be roughened, cleaned and wetted before fresh concrete coming in contact with it is deposited.

Coloring—Dry mineral colors affect the cement least and are mixed in proportions given in the following table:

Color.	Mineral.	Pounds of mixed color to one bag of cement.
Gray	Germantown lamp black	¼
Black	Manganese dioxide	½
Black	Excelsior carbon black	2
Blue	Ultramine	5
Green	Ultramine green	6
Red	Iron oxide	6
Bright red	Pompein or English red	6
Sandstone red	Purple oxide of iron	6
Violet	Violet oxide of iron	6
Brown	Roasted iron oxide	6
Yellow	Yellow ochre	6
White	Mixture of lead and zinc salts with calc-spar. Or, use white sand and crushed marble in the proportion.	
Granite	Use crushed red granite instead of limestone.	

Waterproofing—It is not an easy task to make concrete absolutely watertight. It is a very dense mixture indeed that water cannot find its way through. Either the whole body of the concrete must be rich and dense or else a rich, dense surface an inch or two thick must be applied on the side from where the water comes, or apply tar-papers or felts to the surface.

Apply the waterproofing to that side of concrete from where the water comes, else the pressure of water will force the moisture through or force off the waterproofing.

If the concrete is in place and it is later found to need waterproofing, dig out any soft spots which may be found on the surface of the concrete. Roughen the surface, brush well with a wire brush, and apply a wash composed of a solution of one (1) part hydrochloric acid to four (4) parts of water. Wash this off thoroughly with clean water soon after the solution is applied in order to prevent the acid eating too deeply into the concrete. Then put on a fresh coating of a 1 to 1 mortar not less than one (1) inch thick.

In some instances mixing 1 part thoroughly slacked lime to 10 parts of cement, in a dry state, using this as cement in a concrete, will make a watertight mixture. The mixture of lime and cement may be used successfully as a wash.

Special preparation and special felts and papers for waterproofing purposes are advertised on the markets. The companies handling these goods will be glad to give advice concerning them.

Forms—The moulds or forms should be of a substantial character, the material and framework being sufficiently strong to be unyielding during the process of filling and tamping. The forms may be held together by braces, rods, wires or special devices, so that they may be easily removed. Use a dressed face on the lumber next to the concrete for a finished surface and prevent the concrete from sticking to the forms with paper or by smearing the face of the timbers with oil or soft soap. See Figs. Nos. 3-4-5-6-7.

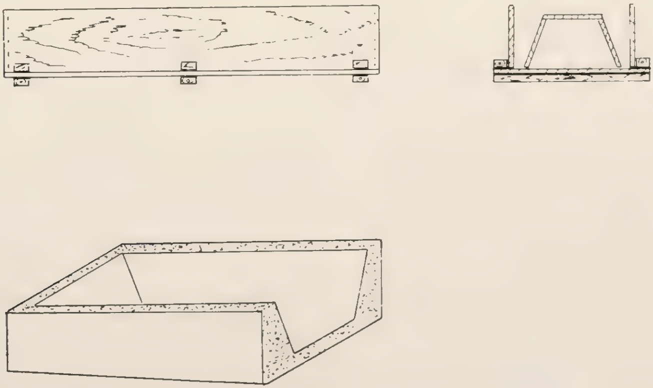

Figure 3. Shallow trough from inverted form.

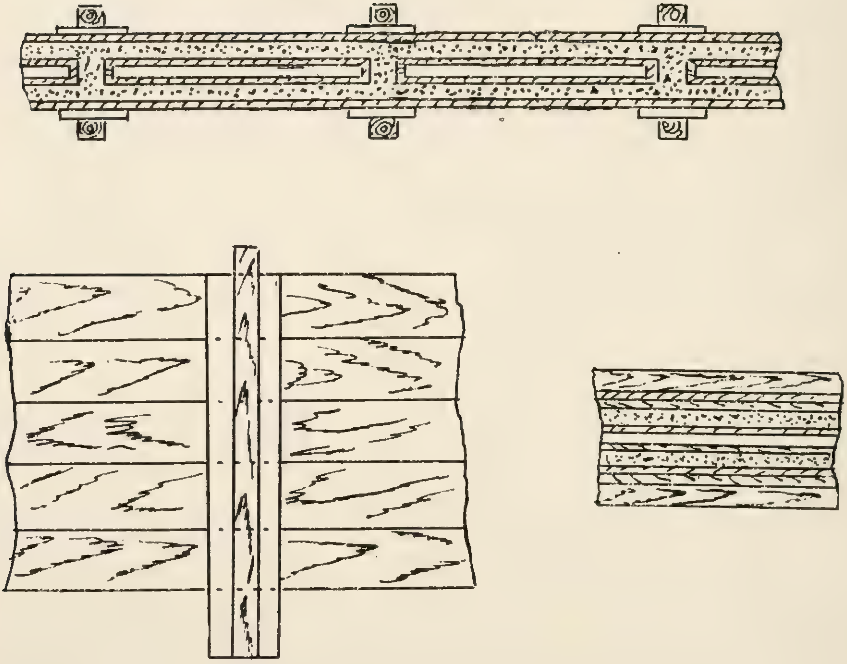

Figure 4. Form for double wall construction.

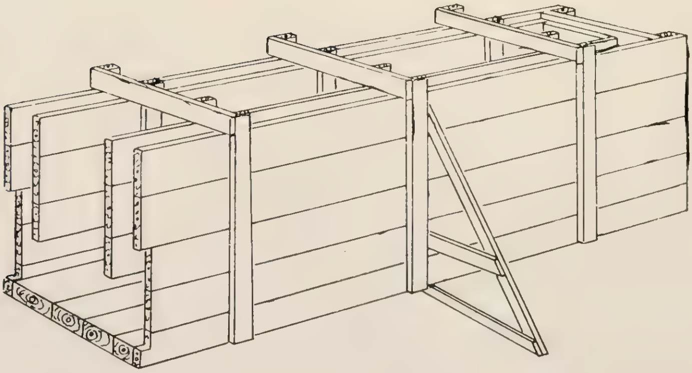

Figure 5. Plain form for trough construction or similar shape.

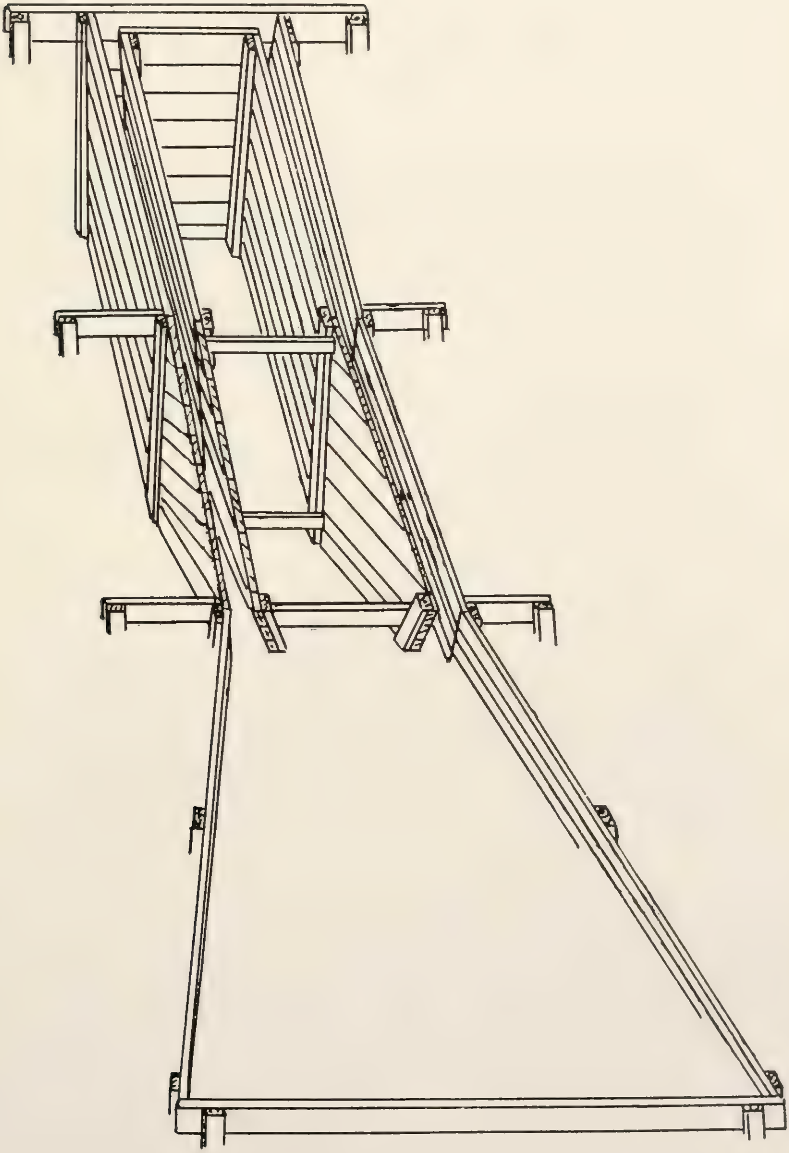

Figure 6. Form in the ground for stationary dipping tank.

The forms should remain undisturbed from 3 to 10 days, depending upon the weather conditions and the nature of the loading. A wet mix will be longer in setting than a dry one, while concrete takes longer to set or harden in cold or damp than in warm or dry weather.

Foundation concrete may be put into excavations without the use of forms, provided the sides of the excavation are reasonably true and sufficiently firm to withstand the tamping of the concrete without yielding.

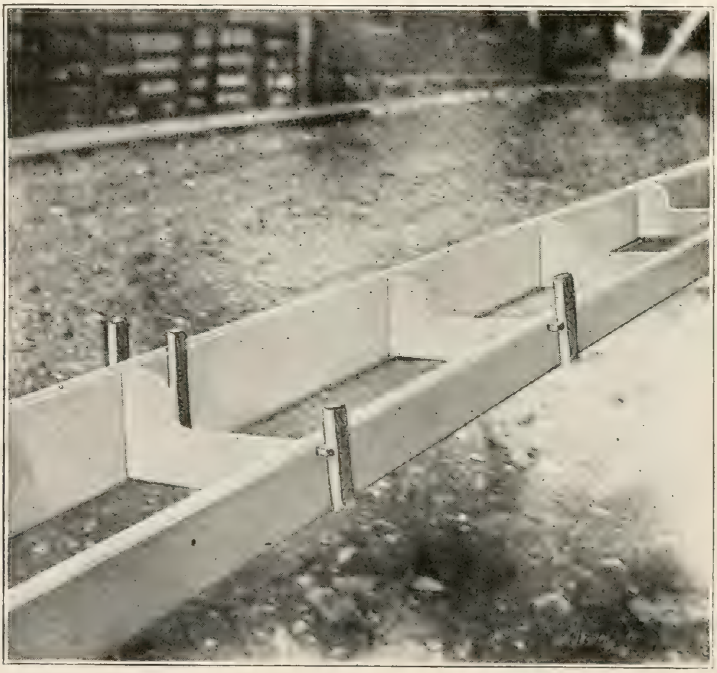

Figure 7. Forms set for concrete curbing.

Circular Forms—There are two sides—inner and outer—in a circular form. Both sides are made in the same way, but the radii of the forms being different, they are not made by the same pattern. Make a circular form by drawing a circle of the size of the form desired and laying boards around the circumference of the circle. Nail the boards lightly together and, with the same radius, mark out the circle on them. Then knock them apart and saw them out along the lines marked and again fasten them together, this time securely. After enough forms are made for a section of the circular figure, set them up, equally spaced, and put on the side boards or ("lagging.") See Figs. Nos. 8 and 9.

Plain and Reinforced—Concrete is either plain or reinforced. One is concrete without any kind of reinforcement and in which all the stresses are carried by the concrete. The other is plain concrete, reinforced with steel bars, beams or other forms of metal or material.

Reinforcement is placed in concrete in order to take up certain stresses and reduce the volume of concrete. Concrete is strong in compression but weak in tension, so if steel is embedded in the concrete in the proper place to take up the tensile stresses, a great saving of concrete is effected. The result is that reinforced concrete is the cheapest where concrete material is costly and is adaptable for purposes where plain concrete is unfitted.

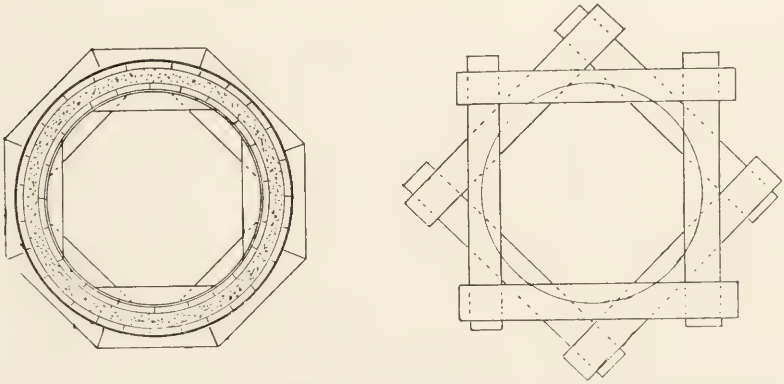

Figure 8. Circular form.

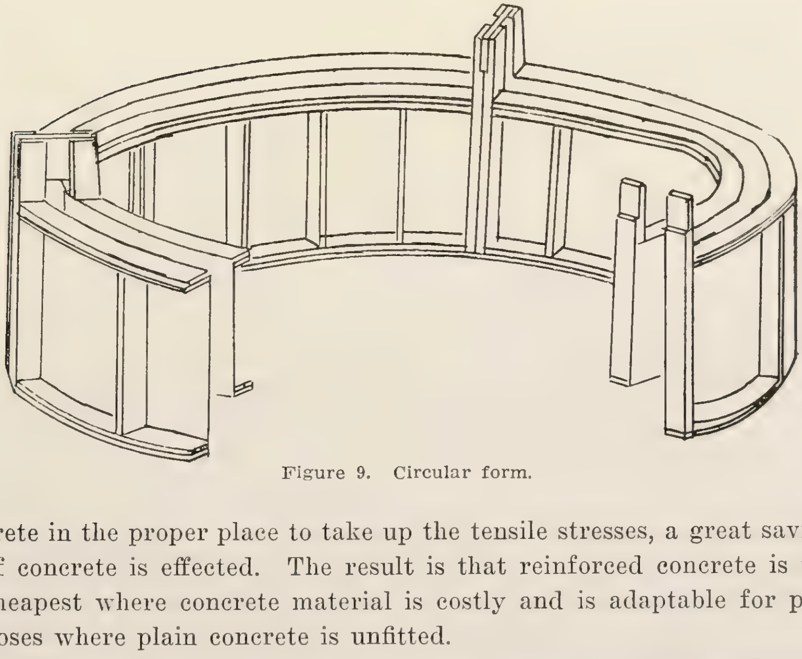

Figure 9. Circular form.

The reinforcement must be properly placed in order to develop the strength of the structure. As for example, load a concrete beam to the breaking point and it will be seen that the lower part of the beam has pulled apart, was in tension, while the upper part has crushed together, or was in compression. Therefore, if a beam be reinforced, the reinforcement should be placed near the lower part of the beam in order to take the tension, else the strength of the reinforcement is undeveloped.

In placing the concrete, take especial care not to displace the reinforcement from its true position and to wholly and solidly embed it within the concrete.

Costs—Cost items are entirely dependent upon the local prices of material and labor. The cost of forms range from 20 to 40 per cent. of the cost of the concrete. An approximate rule with which to arrive at the amount of lumber necessary for forms is to multiply the number of square feet of surface area of the structure to be sheeted by 2.7; the product is the number of feet B. M. required for sheeting the area 2 inches thick and the necessary studding to hold it in place. The forms are erected and taken down for about $7.00 per 1,000 feet B. M.

The cost of mixing and placing concrete by hand is about $1.25 per cubic yard. Where the quantity will justify the use of a machine mixer, it can be done for about one-half to three-fourths of that amount.

With price of cement 40 cents per bag, sand and rock or gravel each $1.50 per cubic yard, lumber $20.00 per 1,000 B. M., and labor 17½ cents per hour, the actual cost is about as follows for a 1-3-6 concrete:

Cement	$1.75	per cubic	yard of	concrete.
Sand	0.75	"	"	"
Stone	1.50	"	"	"
Mixing and placing	1.25	"	"	"
Lumber for forms	0.70	"	"	"
Erecting forms	0.30	"	"	"
Total	$6.25	"	"	"

This includes nothing for excavations, superintendency and incidentals.

Steel for reinforcement at $30.00 per ton is about $1.30 per cubic yard of concrete. It costs about $7.00 per ton to place or 20 cents per cubic yard of concrete, making an additional cost of $1.50 or $7.75 per cubic yard of reinforced concrete.

Other costs under varied conditions can be obtained from the practical statements and examples in the last part of this bulletin.

GENERAL USES.

Buildings—Concrete is useful as a building material for dwellings and houses because of its adaptability to any form, fireproof qualities, low insurance rates, low maintenance costs and stability. Concrete in building construction is made as a monolith or solid wall, hollow wall, hollow concrete blocks and stucco.

The solid wall is used in the construction of large buildings, warehouses, barns and dwellings. Nine inch solid walls are sufficiently thick for the ordinary 2-story dwelling. They may be of either plain or reinforced concrete. Fig. No. 10.

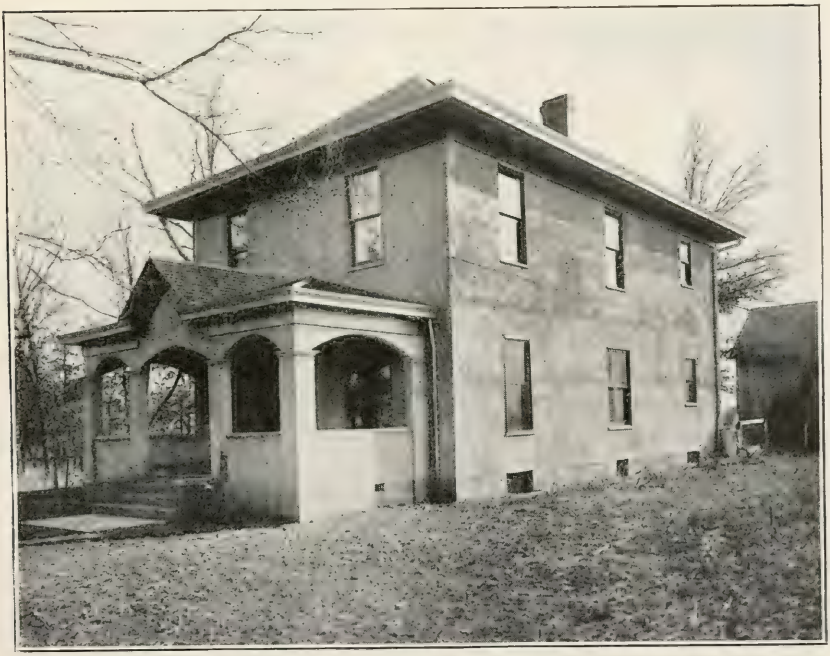

Figure 10. Monolith concrete farm home, rough finish, near Springfield, Mo. Farm name, "Romania;" owned by John and L. C. Baxter.

Hollow wall construction consists of two 6-inch plain concrete walls, or 4-inch walls if reinforced, about 3 or 4 inches apart, or open space, and well tied together by concrete or steel bars. Reinforcement is preferable in the thin walls. It is a more expensive method than either that of solid walls or of concrete blocks.

The use of hollow concrete blocks is a usual and a very satisfactory method. The blocks are 9 inches thick for a 2-story residence. The aggregate should not exceed ¾-inch in size of any piece. The sand should be coarse, clean and sharp. The mixture may be 1 part cement and not to exceed 3 parts of sand and 4 parts stone. Figs. 11 and 12.

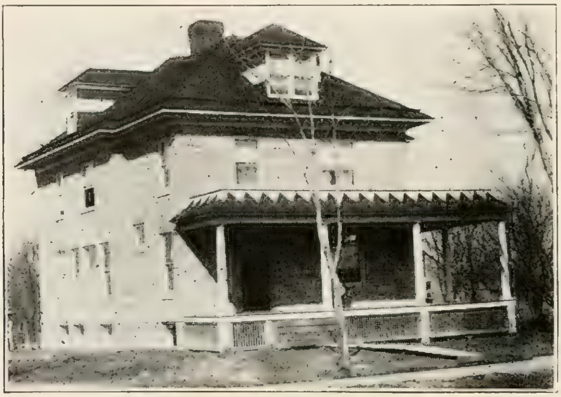

Figure 11. Concrete block dwelling, 33x37 feet, Putnam county.

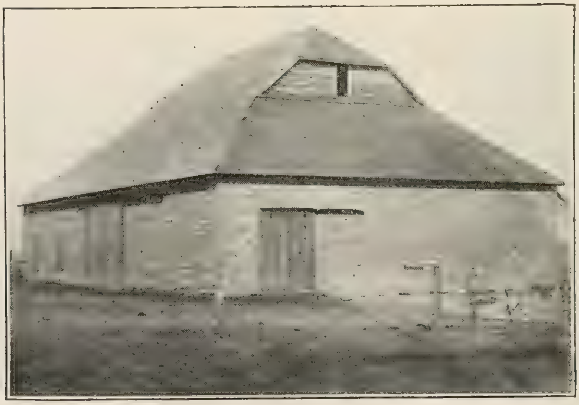

Figure 12. Concrete block barn, 70x80 feet, Putnam county.

Stucco work is frequently employed in the construction of dwellings. The inner or scratch coat, that next to the laths, is ½ inch thick. After it has set, the finish coat of 1 inch thick is applied.

The concrete foundation walls and piers in any of the above should not be less than 12 inches thick on a sound footing course and firm bearings. The partition walls are of laths and plaster, or preferably 4 inches of hollow concrete or 3-inch hollow blocks plastered over. The concrete floors should be covered with a single layer of wood resting on thin sleepers.

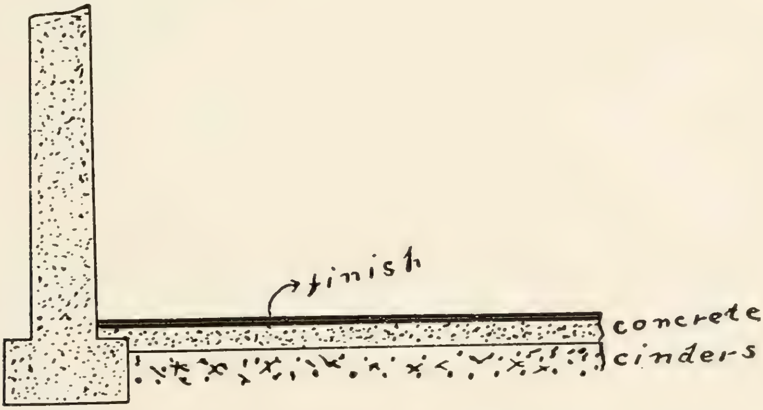

Figure 13. Partial cross section for a concrete basement floor.

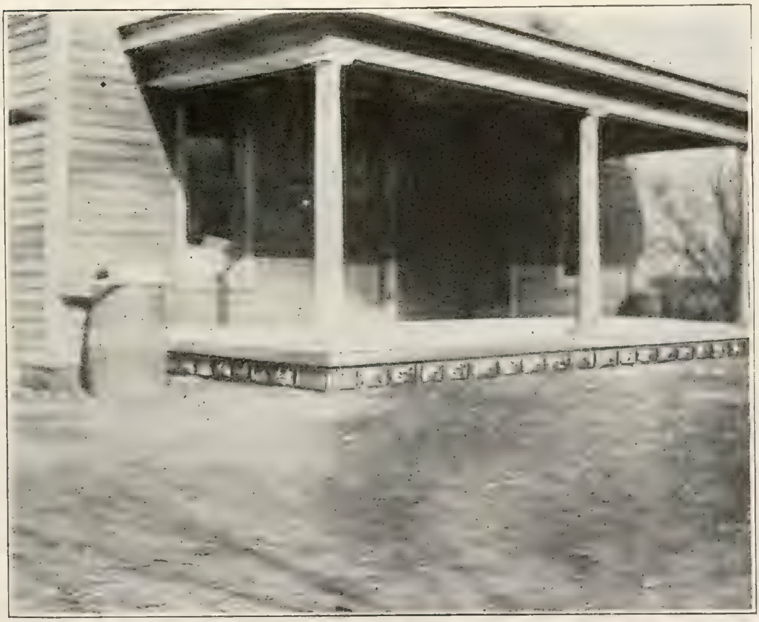

Figure 14. Monolithic porch floor.

If one considers erecting a good residence of concrete, he is advised to consult books upon this subject, which make dwellings a specialty. Consult also a civil engineer or an architect and have plans drawn for the building. It must be remembered that cheap supervision, as well as cheap workmanship, may result in an expensive building.

Basement Floors—The subgrade for cellar and barn floors should be firm and solid. If the subgrade is wet or damp, the better practice is to drain it with drain tile. If this is not necessary, the floor will have to be thicker than if the subgrade is dry. If the subgrade be dry, put down and tamp 3 or 4 inches of cinders, or other suitable material, and cover this with 3 inches of 1-3-6 concrete. A coat of ½ inch thick of 1 to 2 mortar will give a smooth finish.

Or if a smooth finish is not desired and the subgrade is dry, the cinder foundation and the finishing course may be omitted and 4 inches of concrete layed directly on the soil. Expansion joints are a safe provision against the appearance of unsightly cracks. They can run in the direction of the drainage provisions. Figs. 13 and 14 is a cross section for a floor.

Floor for Mule or Horse Stable—The floor is layed and channeled in the ordinary way. Give the floor a fall of 1 inch in 2 feet to the main drain behind the stalls and a fall in the main drain of 1 inch in 4 feet. Put two iron or wooden rails, or sleepers, across the floor transversely with each stall, and a 3-inch wooden plank flooring on these as a secondary floor on which the animal stands. This secondary floor should be fastened, but in some such manner that it can easily be taken up and removed for cleaning and airing. The slope of 1 inch in 2 feet for the stall floor is too great for the hind flexor tendons of the animal, but this is to be corrected with the secondary plank flooring. Fig. 15.

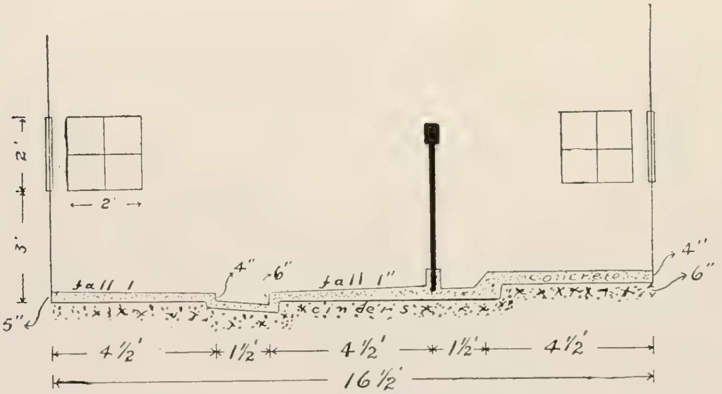

Figure 15. Cow barn floor.

Ice House—There is none better than a concrete ice house if properly built with a double or hollow wall. The interval between the walls must be closed tight at the top and bottom, and the walls, especially the inner one, be made tight so that it is a dead air space. The roof should be made sloping and should contain a dead air space.

The walls must be strongly built to withstand the lateral pressure of a pile of ice and extend well down below the frost line. A good foundation, with especial attention paid to drainage under and around it, is absolutely necessary.

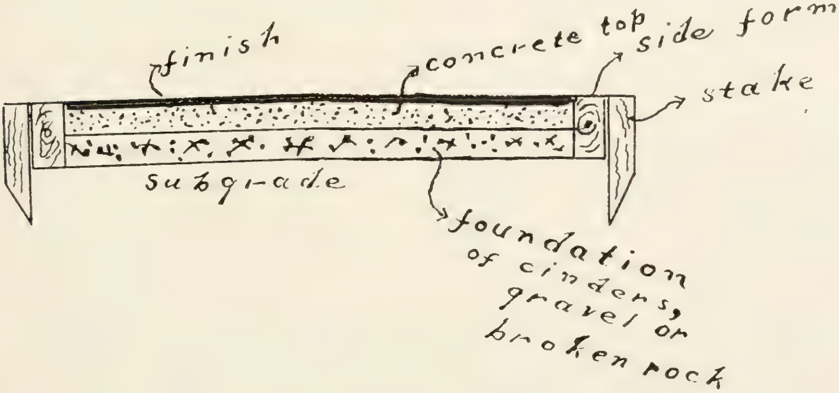

Figure 16. Cross section of walk construction.

For an ice house of the ordinary size to supply a family of six, the walls should each be six inches thick, if made of plain concrete, or if well reinforced, 4 inches. In either case, they must be well tied together and spaced about twelve inches, center to center of wall.

Concrete Walks—A walk consists of the subgrade, foundation, concrete top and the finish (Fig. 16). Lines of cord or twine should be set as markers for the work. The excavation should extend about one foot below the surface as a prevention against heaving by frost.

The subgrade should then be firm, solid and dry. If the soil holds water, it will freeze and lift the walk in sections, and should be tile-drained The subgrade must then be tamped in preparation for the foundation course. On this prepared subgrade place cinders to the depth of six or eight inches, or to within four inches of the proposed finished surface, and consolidate them by tamping. Give the subgrade and this cinder foundation close attention. If cinders are not available, substitute crushed rock, gravel, sand or some material which will make a firm, but porous bed, through which water can drain.

Make forms by driving stakes along the sides of the walk, having the tops even with the finished part of the walk, and nail 2x4 pieces to the stakes as molds for the concrete. Adjust these forms carefully so that they may serve as guides for the straightedge in leveling off.

If the walk be on level ground, give it a slope from the center line to the sides of one-fourth of an inch to the foot, to provide drainage.

Wet this foundation of cinders and cover it with three inches of a 1-3-6 concrete, and level and slope with the straightedge. In order to prevent expansion cracks, the walk may be constructed in sections of four to six feet long, leaving a strip of felt or tar paper between each block. These expansion joints may be made about one-fourth of an inch thick by cutting into the fresh laid concrete with a spade and filling the space with sand instead of using strips of tar paper.

Finish this off with a wearing course one inch thick of a mortar composed of one part cement to two parts sand, troweled and smoothed off to a good appearance. As soon as the film of water has left the surface, trowel it till perfectly smooth. This finishing course should follow the concrete course immediately and be spread on and smoothed before the bottom course of concrete has set.

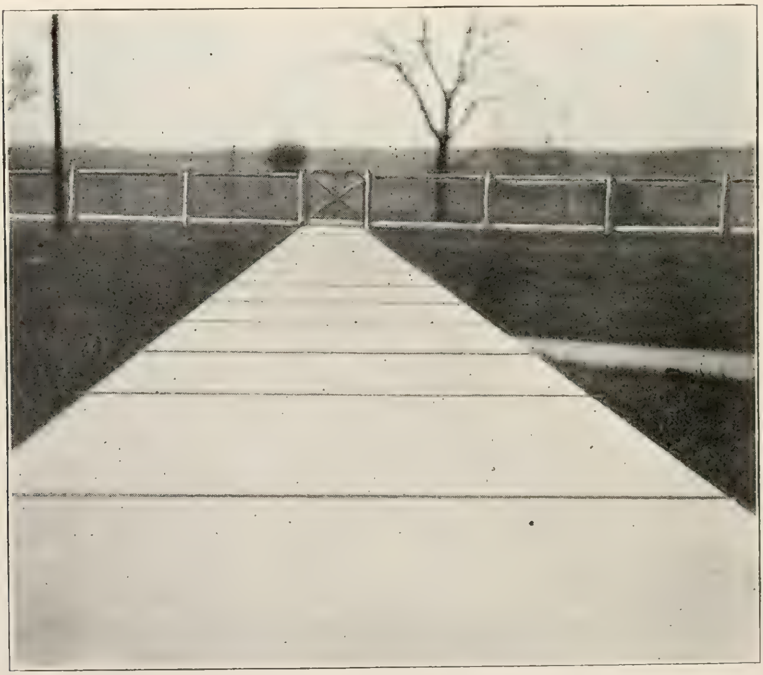

Figure 17. A completed walk, showing expansion joints.

With the trowel and straightedge, divide the finishing course into sections exactly over the joints in the concrete course. Then with a jointer give the top a finished appearance and use an edger to finish the sides next to the mold into a smooth rounded appearance. Protect the completed walk from the sun and keep it sprinkled for three or four days. (Fig. 17.)

Silo—Excavate (Fig. 18) for the whole base and foundation well below the frost line. The foundation walls should rest upon a firm soil. Build to above the surface of the ground a circular foundation wall in this excavation from 16 to 20 inches thick, depending upon the size of the proposed silo. When this wall has seasoned and the forms are removed, fill several inches of the excavation within this foundation wall or space with cinders, gravel or broken stone, tamping them well as they are placed. After roughening the six or eight inches of the foundation walls above the filled space and wetting the filled-in material, finish flooring the space with a rich concrete. This is the foundation and floor for the silo. Be sure it is well drained.

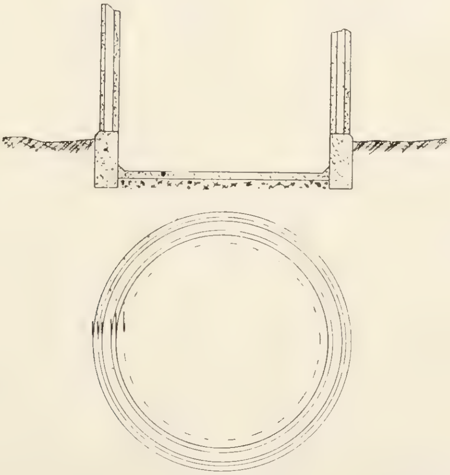

Figure 18. Silo foundation and section of walls. Hollow wall construction.

Erect the walls of (Figs. 8, 9 and 18, circular forms) hollow reinforced concrete three or four inches thick with a six or eight-inch air chamber. They must be well reinforced, vertically and horizontally, with one-half inch steel rods vertically about three feet apart near the outside of each wall, lapping well at loose ends and well into each form section, and by one-half inch steel hoops horizontally in each wall running entirely around the wall and spaced one foot. Use either this or its equivalent in reinforcing.

Erect these walls in sections of four to six feet, allowing the first to get well set before removing the forms to place on the next section. The forms should overlap the section already built by three or four inches to insure a good and plumb connection. The top of each finished section should be cleaned, roughened and wetted before depositing the concrete of the following one.

Make a smooth interior finish and wash down the whole of both the interior and exterior with a cement wash (cement and water) or with some waterproofing wash or paint. It may be necessary to re-wash the interior wall surface every few years.

Openings for doors can be left as desired, and a chute built of concrete, terra cotta or tile pipe may be built simultaneously with the walls.

The roof may be built of concrete or timber. It should have a manhole and a ventilator. Make provisions also for ventilating the spaces between the walls.

Fence Posts—The usual length of fence posts is 6½ feet. The cross-section varies more with the individual opinion than that of the length. In some they are of a square cross-section five to six inches at the large end, tapering to three to four inches at the small end; others are rectangular, about 4x6 at one end, tapering to 3x4 at the other; still, others have been made in a triangular form, with equilateral triangles, of sides six inches at the butt end to five inches at the small section; some are of the same cross-section the whole length, while still others are circular in form. A good form is a square cross-section five inches at the large, tapering to three inches at the small end, and reinforced with a one-half-inch rod or the equivalent at each corner. The corner and gate posts should be nine inches

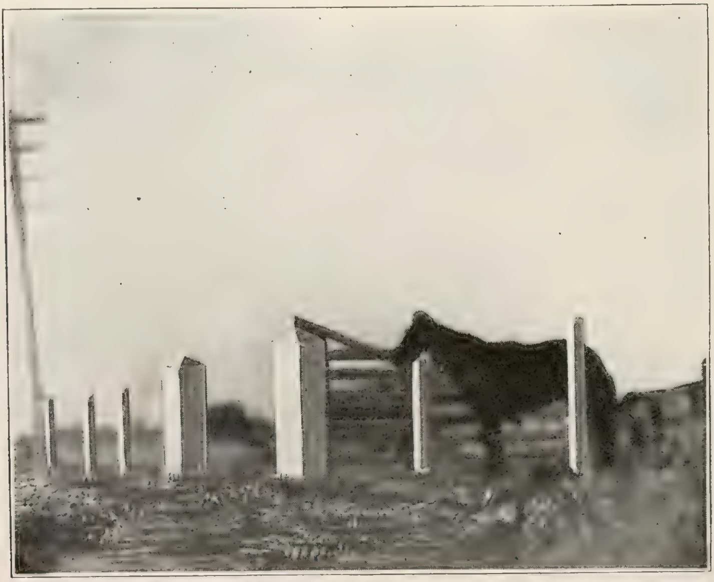

Figure 19. Concrete posts.

and seven inches at the two ends (Fig. 19). All fence posts should be reinforced.

Posts are not difficult to mold. A stiff, strong mold is required, made in the shape of a trough, larger at one end than the other and tapering on all four sides. (See Fig. 20.) The wiring attachments can be placed on the open side of the form. The aggregate used in the concrete should not exceed three-fourths inch in size of pieces. The concrete must not be too wet and should be firmly tamped into the molds. The forms can be removed in from 48 to 60 hours, depending upon the conditions. They should be protected from the sun and air currents, and kept moist for four or five days.

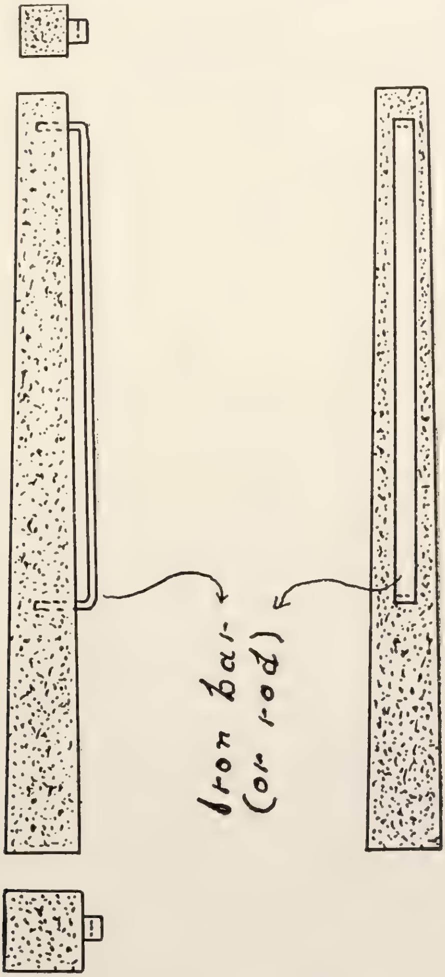

Figure 20. Fence posts.

An advantage in making a post of the same cross-section, say five inches square, is the ease and rapidity of making the molds. Long trough-like molds can be made without sawing and cutting, and by putting in blocks at the 6½-foot intervals several posts can be made in the one set of molds at the same time.

The wiring attachment can be arranged in different ways. Holes may be left through the posts at intervals where the fence wire is to be fastened by greased bolts or iron pins placed through the concrete and withdrawn when it has begun to set. The fence wire can then be wired through these holes or slips of plank can be bolted to the side of the post through them and the wire attached to the plank. A spike can be left in the concrete at intervals and the fence wire attached to these, or bent pieces of wire, with the ends embedded well into the concrete, the wire forming a loop on the side of the post to which the fence wire may be wired by means of a hog-ringer and rings.

A better, but possibly a little more expensive, way is to have a bar of iron for each post, about five feet long, one-fourth inch thick by one-half inch wide, and bent the wide way of the bar at each end for about four inches in length, as in Fig. 20. These bent ends can be placed three inches into the green concrete post when it is finished, leaving the body of the bar parallel with and an inch from the face of the post and the broad side to the post. The fence wire can be wired to this iron bar.

Two men can make 40 to 50 of these posts per day at a cost of 30 or 40 cents per post, depending upon the local prices. This price includes the entire cost—forms, labor and all material. The cement alone, which is usually about the only actual cash cost to a farmer, is eight or ten cents per post.

Patented post forms and fasteners for the wire are also advertised in the farm papers.

PRACTICAL EXAMPLES.

FOUNDATION SILLS FOR GRANARY.

Mr. J. H. Crowell of Bertrans, Mo., has constructed six foundation sills for a granary, each thirty-two feet long with a section fourteen inches wide at bottom, six inches wide at top and twelve inches high, containing 5.9 cubic yards. About five and one-half cubic yards of sand and gravel were used and five barrels of cement. The cost was $17.20 for material and $7.00 for labor. Old scrap lumber was used for forms. The cement, sand and gravel was mixed dry by turning three times, and after water was added, the mixture was turned twice. Mr. Crowell considers concrete the best and cheapest foundation material available there. Experiments made indicate that a mixture of one part cement to seven parts sand could be made into cement blocks suitable for foundations at a cost here of ten cents for a block 14″x14″x6″.

FENCE POSTS AND WATER TROUGH.

I have concrete fence posts on my place that are made of 1 part cement, 2 parts sand and 3 parts gravel. They are reinforced with two strands of No. 9 wire or old barbed wire. The cement and sand were mixed together dry, the gravel then added and mixed, when water was added sufficient to make it the consistency of stiff mortar. My fence post moulds are made of 3 pieces of 2x4 timber and one 2-inch plank. The cement alone cost me about six (6) cents per post.

An open water-trough, built of concrete, about 200 feet long, with a good fall to carry off waste water from the house, is one of the best structures I have on the place.

JULIUS ALBRECHT,
Commerce, Mo.

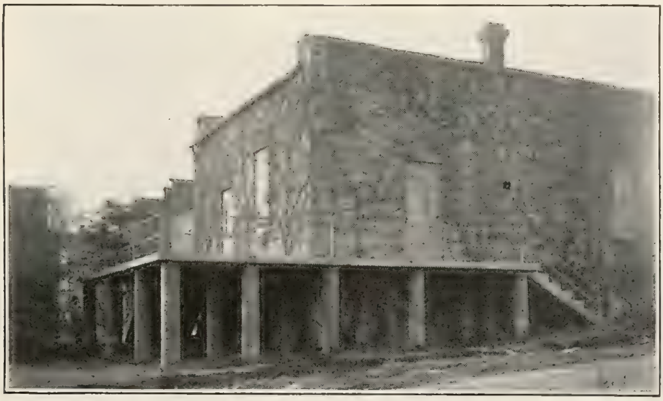

Figure 21. Concrete porch pillars and floor, J. F. Short, California, Mo.; 12x26 feet on one side of building, 5x15 on other. Highest point from ground, 6 feet; circular pillars, 36 inches in circumference. Floor 5 inches thick, one solid piece, reinforced with ½-inch twisted bars.

TWO-STORY RESIDENCE.

In the summer of 1906 I built a two story residence 28x38 feet. It was boxed and then covered with expanded metal lath, on which was applied a coating of mortar of 1 part cement to 2 parts sand. The mortar was of a consistency that it could be applied with a trowel. It is very satisfactory.

A porch 14x20 feet, 7 feet from the ground, in one solid piece, was built to it with a cellar underneath. The concrete in the porch was 1 cement, 3 sand and 3 gravel, reinforced with sliding door-track bars, one every 6 inches. It was finished with a 1 to 2 mortar. There are no cracks and it does not leak.

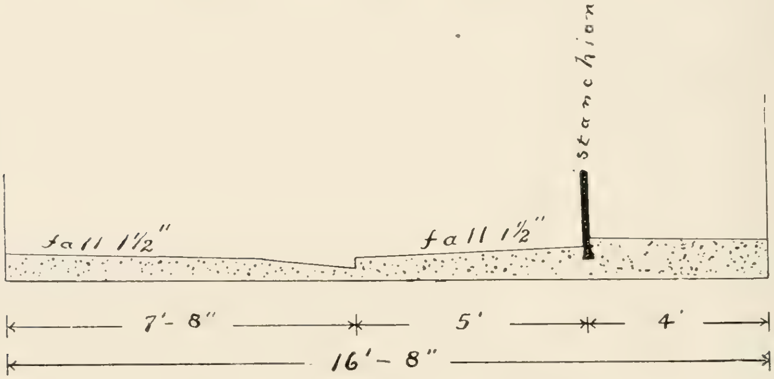

Figure 22. Dairy barn floor, Fred North.

Fig. No. 22 is end elevation of a floor to a dairy barn built in 1909. Both barn and floor are of concrete. This floor is made with a mixture of 1 part cement, 3 parts sand and 5 parts of fine creek gravel, finished and troweled off with a 1 to 2 mortar.

FRED NORTH,
Neosho, Mo.

HEN HOUSE AND CORN CRIB FLOOR.

I have constructed a corncrib floor and a hen house of concrete. I find the corncrib floor too damp.

The hen house is 12x20 feet with a flat roof 5 inches thick. My proportion of concrete was 1 cement to 7 chats. Field rock was used in the walls to fill up and cheapen the work. The roof was reinforced with wagon tires and gas pipe spaced about 1 foot one way and 3 feet the other. The roof leaked like a sieve until it was washed with pure cement.

H. G. RICHARDSON,
Neosho, Mo.

EIGHTY RODS OF FENCE.

Having a lot of loose boulders, or field rock, on my farm, I used some of them to build a fence, now completed, 80 rods in length. Instead of mixing sand with the cement, I used our mine refuse, called "tailings" or by some "chats." This material is ground flint, crushed to from double the size of a pea to fine sand.

My forms were 2x12 inch plank, 16 feet long, held together by yokes constructed of 2x4 pieces, nailed together at the top so they could be slipped off to remove the forms. In building I would first put in a course of field rock and then grout them in with a mortar of cement and chats; then another course, and so on, until the top of the fence was reached, when I placed large boulders on the top embedded in the mortar. Nothing but a sledge will knock them off. The fence is 8 inches thick and 3½ feet high. The cement cost me about 60 cents per rod.

This fence was placed around an old wire fence which was not disturbed, but the wire, posts and all were embedded in it.

All my corner and gate posts are set in rock and grouted with cement, and if this old world should ever turn over something will be found sticking in it on this side.

J. J. HARRISON,
Webb City, Mo.

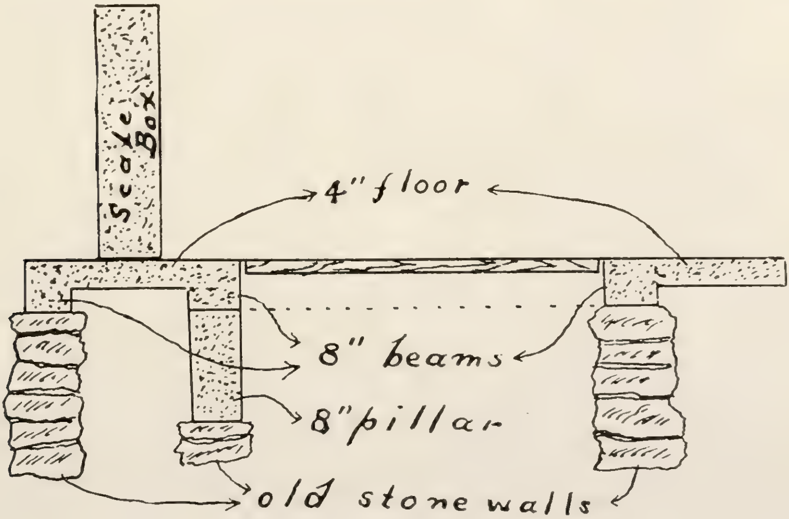

Figure 23. Cross section in construction of weighing scale, frame and box.

SCALE FRAME AND BOX.

The uses of cement around the farm home has been well developed through the community southwest of Monett, Mo. This is largely due to Asa F. Wormington, who took up the work at odd times of leisure from his farm work. Figs. 23 and 24 are of a weighing scale, frame, box and all built by him, among other things, for J. F. Mermoud, which he describes as follows:

"The old scale pit was already built of stone masonry, upon which I began the concrete work. The concrete beams around the wagon platform were made 8x8 inches, using 2x8-inch stuff for frame work. The beam between the wagon platform and the scale box is supported under the center by an 8x8 inch pillar. The floor along each side of the wagon platform is 3 feet wide, including the beams, and 4 inches thick."

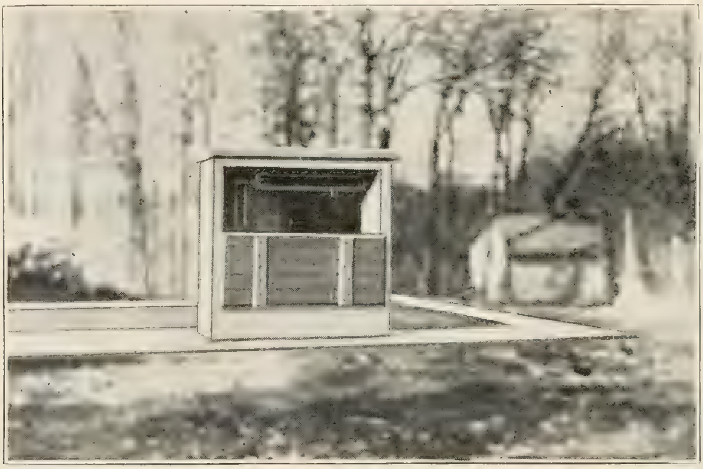

Figure 24. View of scale box, concrete, showing scales and lowered wooden door.

"The outside of the moulds for the scale box was 3 feet 9½ inches x 3 feet 9½ inches x 12 inches thick in the clear. The inside of these moulds was 3 feet 3½ inches x 18 inches on the outside, thus leaving the sides 3 inches thick and the top 2 inches. The inside of the moulds was of light, soft material, so that it could be torn out. Other than the opening for the scales and a 3-inch hole for the balance rod, the scale box is solid concrete."

"All of the framing was ready, even the scale box mould set up, plumbed and braced exactly where it ought to be, before any concrete was mixed. The bottom of the box was put on a level with the platform and held in place by driving two posts in the pit and two on the outside of the side platform. Then two pieces, 2x4—one piece near the top and one near the bottom, were nailed to each end of the box and to the posts."

ASA F. WORMINGTON,
R. F. D. 4, Monett, Mo.

WALKS, PORCH AND FLOWER URN.

This view (Fig. 25) of the side and south face of my residence shows a concrete flower urn in an angle of the walks, a concrete side porch and a small percentage of my concrete walks.

This porch has a very strongly built floor. It is in one solid concrete block, 4 inches thick, 9 feet wide and 16 feet long. It rests upon 13 concrete pillars 2 feet high, those at the corners being 12x12 inches, the others 8x8. These pillars were moulded separately and set up and plumbed on the foundation.

An excavation to below the frost line and to a solid bearing was made for the foundation and filled with rock, small gravel and sand, well tamped as it was placed. When this was done and the pillars set, a framework was built up out of 2x8 stuff to within 2 inches of the top of the pillars, and a platform of 2-inch material built on this framework to receive the floor. A 2x4 around the outside then prepared the forms for the flooring. The concrete mixture was 1 part cement to 5 parts chats.

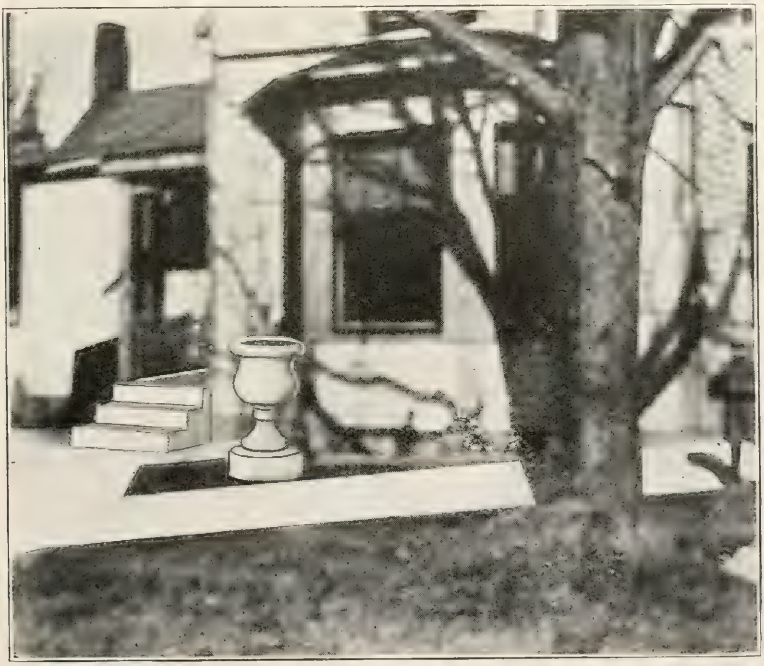

Figure 25. South face of residence of J. F. Mermoud, Monett, Mo.

J. F. MERMOUD,
Monett, Mo.

MANURE PIT AND POULTRY HOUSE.

Mr. Mermoud has also constructed a manure pit and poultry house of concrete. The manure pit is 8x12 feet x 3 feet deep, inside dimensions, with an addition 4x5 for out privy. The walls and floor are 8 inches thick, composed of concrete, 1 part cement and 6 parts natural creek gravel. A 1¼-inch gas pipe was put upright in the walls at each corner, 18 inches into the concrete, and extending 3 feet above. The posts of the roof are set into these gas pipes, so that it may be removed when loading wagons from the pit.

The poultry house is of wood 14x40 feet with a concrete floor. The floor consists of a few inches of field rock grouted with sand to raise above the dampness, over which is 4 inches of concrete, composed of 1 part cement to 7 parts creek gravel, and finished with ½ inch of 1 to 3 sand mortar.

WELL COVER AND WASH BOWL.

The concrete work in and around my farm building has been done by Mr. Wormington and myself. The foundation for the house was excavated to a firm soil and filled first with a course of field rock, well rammed, then a course of concrete composed of 1 part cement to 6 parts natural gravel, until brought to the required height, the last course being of concrete.

The porch floors and walls were made in the same manner except that small rock were used in the walk foundations. Both the porches and walls were finished off with a mortar of equal parts of cement and sand.

We made a form 8x8x1 feet of 1 inch lumber for the well covering and fitted a smaller one inside of this, making the smaller form the size of the desired pump opening. The concrete was put into place between these forms. The concrete was 1 cement to 6 chats, finished off with one inch thickness of 1 part cement to 2 parts sand.

The wash bowl, or basin, had been in the moulds several days before the well covering was made and was ready to set into the green concrete of the well covering. The stem and bowl of the wash basin were moulded separately from a mixture of 1 part cement to 2 parts chats. The mold for the stem was a stiff piece of tin 24 inches long, and so lapped that the opening was of the shape of the frustrum of a cone, 6 inches in diameter at the larger end and 4 inches at the smaller. This mould was placed, with the big end down, on a smooth surface and a ½ inch iron rod 26 inches long placed upright in the center. The 2 inches extra length of rod extends up into the concrete of the bowl to stiffen the attachment.

The bowl was moulded in an old iron kettle of about the desired size. A piece of round wood 3 inches in diameter was placed upright in the center of the bowl to provide an opening for the iron pin left in the stem. Another piece of wood, 1 inch in diameter, was placed to one side for the drain hole. Each piece of wood was greased with lard and wrapped with paper to make doubly sure they could be removed without injury to the concrete. The bottom of this bowl is made 3 inches thick and tapers off on the sides to 2 inches at the rim. It is 5 inches deep on the inside.

The stem was set into the green concrete of the well platform, or covering, and mortar worked around the foot of the stem till secure and shapely. After this had set the wooden plugs were removed from the bowl, set on the stem and mortar worked and tamped in the opening left by the larger plug and around the iron connecting pin until even and smooth with the interior of the bowl.

WASH MONTGOMERY,
Monett, Mo.

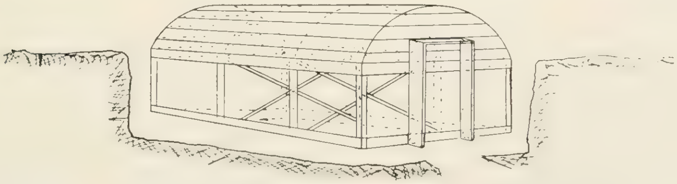

Figure 26. Inside skeleton frame for cellar as built at McCormicks.

CYCLONE CELLAR.

This cyclone cellar (Fig. 26), built by Mr. Wormington for the family of Andy McCormick, has a floor 7x10 feet x 5 inches thick; walls 4½ feet high x 12 inches thick; roof is a half circle 12 inches thick, reinforced with 10 wagon tires 15 feet long. The entrance has steps of 12-inch tread and are 12 inches thick, with sidewalls 8 inches thick. The mixture is 1 part cement to 6 parts chats, coated on inside and outside with 1 part cement to 2 parts sand.

The reinforcement cost $13.25 delivered.

Cement cost 43 cents per sack delivered.

Sand cost 10 cents per bushel delivered.

Chats cost 10 cents per 100 pounds delivered.

Haul is 2¼ miles from Monett. The total cost was $153.00.

The ground plan of the concrete cellar (Fig. 27), built by Mr. Wormington for Robt. Teel of near Monett, Mo., is 10x14 feet outside dimensions. The side walls, 10 inches thick, are 6 feet high, 2 feet below and 4 feet above the surface. The oval roof has a rise of 3 feet 2 inches and extends 1 foot beyond the side and end walls. It is 7 inches thick except on the side extensions, which are 4 inches at the edge. The only reinforcement used is a 1 inch square rod, 10 feet long over the door. The roof is supported across the center by a 4x8-inch concrete beam. The mixture in the walls is 1 part cement to 7 parts natural creek gravel. In the roof it is 1 part cement to 5 parts mining chats.

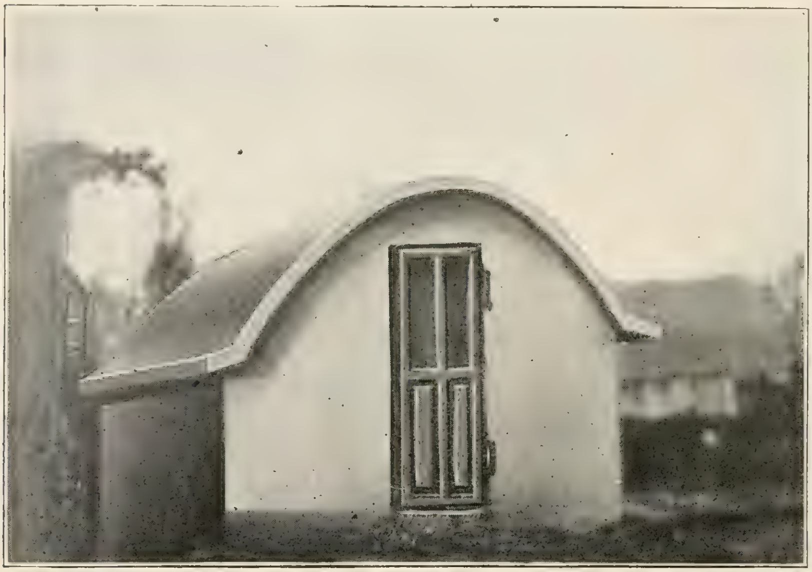

Figure 27. Concrete cellar built by Mr. Wormington for Robt. Teel.

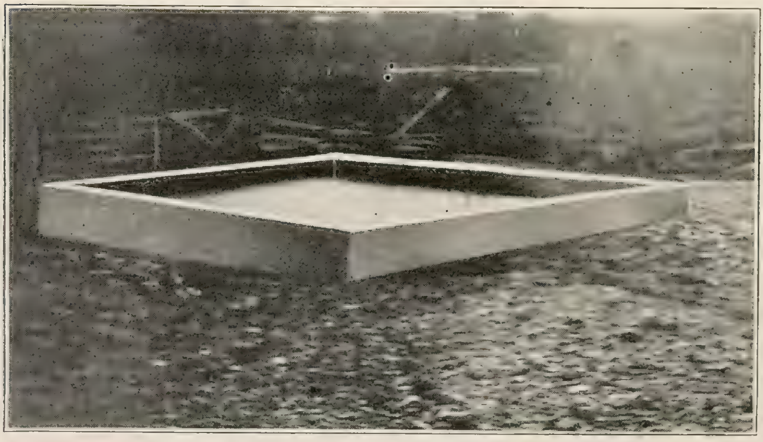

Figure 28. Watering tank on the Ozark Stock Farm.

WATERING TANK.

The watering tank (Fig. 28) was built two years ago of plain concrete and holds water like a jug. The inside dimensions are 18x20 feet x 2 feet deep. The side walls are 12 inches at the base and 6 inches at the top, the bevel being on the inside. The mixture is composed of 1 part cement to 6 parts sand and coated with 1 part cement to 3 parts sand. I used 10 bushels of sand and 4,200 pounds of cement. The total cost was $32.00.

E. ARNAUD, Proprietor,
The Ozark Stock Farm,
Monett, Mo.

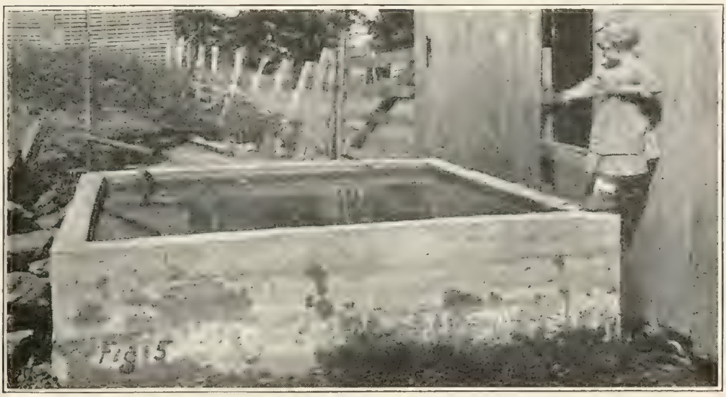

Figure 29. Watering tank.

REINFORCED WATERING TANK.

The above watering tank (Fig. 29) is 8 feet square, the side walls 5 inches thick and the bottom 6 inches. Each corner is reinforced with one old wagon tire at 6 inches from the top, bent at a right angle and extending 3 feet each way. The mixture is 1 part cement, 2 parts sand and 3 parts gravel.

The excavation extended the extreme size of the tank to below the probable freezing point, and was filled with broken, well tamped rock to near the level of the ground. The outside forms were 30 inches high and an extension of the foundation forms. This outside form was solid, while the inside one was built up in sections as the wall progressed. In order to seal the side walls to the bottom, a groove about 2 inches wide, 1 inch deep and 2 inches inside of the outside form was made in the bottom while yet fresh and stiff. The bottom of the inside forms were braced by timbers from side to side (the first brace resting on the bottom of the tank) and securely wired across at the top. The concrete was well tamped as it was placed and the forms left on about one week.

Old lumber, smooth and well shaped, was used in the forms. A gas pipe with an elbow was placed through the wall and sunk into the bottom. The elbow on the pipe turns up so that a section of pipe can be screwed on reaching to the height desired for water level in the tank. In this way it is an overflow pipe, when by removing the section it becomes the drain pipe. The other ingredients with costs were as follows:

5 sacks Portland Cement	$2 40
2 loads sand, 3 loads gravel	2 00
2 men, one day each	2 00
	$6 40

L. D. DUNAWAY, M. D.,
Caplinger Springs, Mo.

CEMENT TILING.

I made and placed 5,000 feet of 4-inch cement tiling last year and found them so satisfactory that we made 9,000 feet more, to be laid this season.

With the exception of the casting (A) and the casing (B) in Fig. 31, we made the machine ourselves at a cost of $35.00. It is a hand tiling machine with a single bar tamper. It is installed in the frame shown in Fig. 30, the guide and round tamper arranged as shown in Fig. 32 on truck and rollers, so that it can be rolled back from the tile as in Fig. 33. The guide post sets on top of the inner core and is kept in place by an iron pin extending from guide post to ⅜ inch hole at top of the inner core. The guide post is raised by

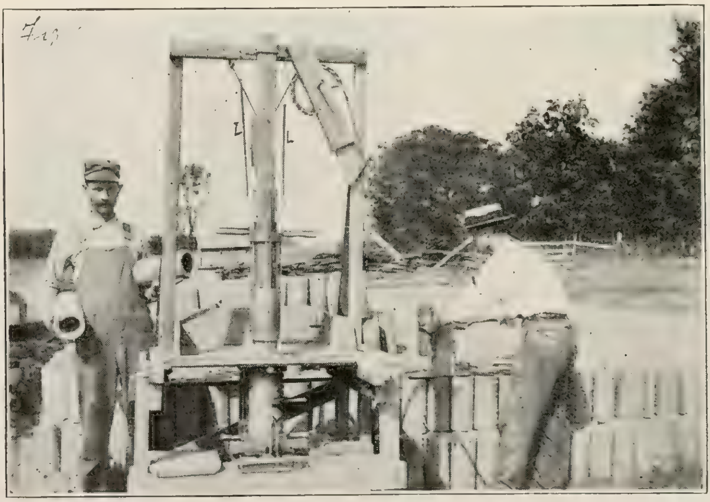

Figure 30. Making cement tile on the farm.

a rope and lever (Fig. 31), and so tabled that all can be rolled back in order to lift the tiling, still incased in the outside casing, from the machine. Fig. 30 shows the tile being removed from the outside casing.

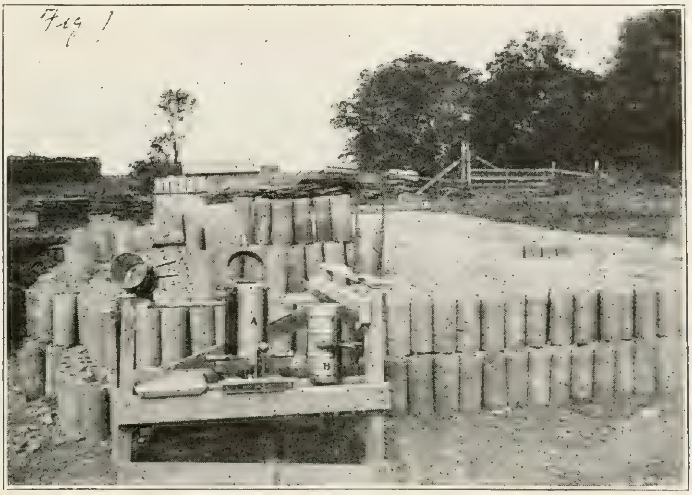

Figure 31. Making cement tile.

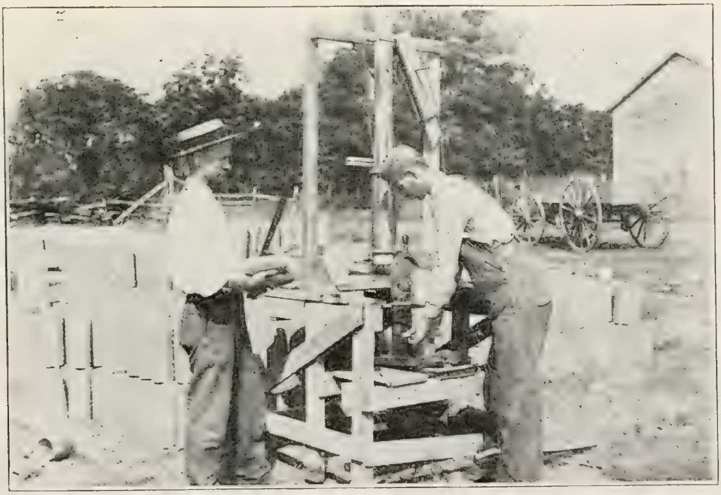

Figure 32. Making cement tile.

We used a mixture of 1 part cement to 6 parts of sand. One hundred pounds of cement made about 110 feet of 4-inch tiling. The sand and cement should be mixed dry and then moistened until it resembles brown sugar, when it is thoroughly tamped. If the tiling cracks or sticks to the casing it is too wet. If upon removing the tile it drops out of the casing, it is either too dry or not sufficiently tamped. In curing, the tiling must be kept damp by sprinkling freely for from 3 to 5 days, and placed, when first removed, on a smooth solid surface. After about 12 hours they may be removed and ricked up. Two men with this machine made 400 feet of 4-inch tiling in 10 hours.

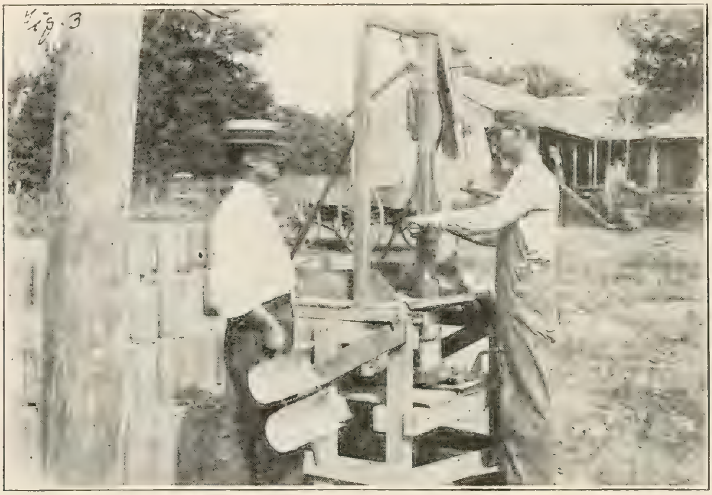

Figure 33. Making cement tile.

L. T. DUNAWAY, M. D.,
Caplinger Mills, Mo.

CEMENT BLOCK SILO.

We have been using cement for the past six or seven years in stable floors and also in a one room solid wall (1 ft. thick, which we consider too thick) concrete house. For all purposes in farm buildings, we consider it the most satisfactory building material and the cheapest, when the saving in painting and general upkeep is taken into account.

Two years ago we erected a silo 17x40 (Fig. 34) of cement blocks 8x8x24, made on a Miles machine. These blocks are faced with a 1½ inch of 1 to 2 mixture, while the body of the block is 1 to 6, using ordinary creek gravel as the aggregate.

Cement mortar was used in the wall and an ordinary two-point galvanized barb wire as a reinforcement to take the strain of the settling silage. The silo has proven entirely satisfactory in every way and is an ornament to any farm.

We are rather at sea on the cost. All the work except the laying of the blocks was done by ordinary farm labor at odd times, but I shall estimate the cost at $425.00.

The silo extends 8 feet under ground, which brings the bottom on a level with the cow stable floor of the bank barn.

JOHN E. HOSMER,
Hosmer Dairy Farm,
Marshfield, Mo.

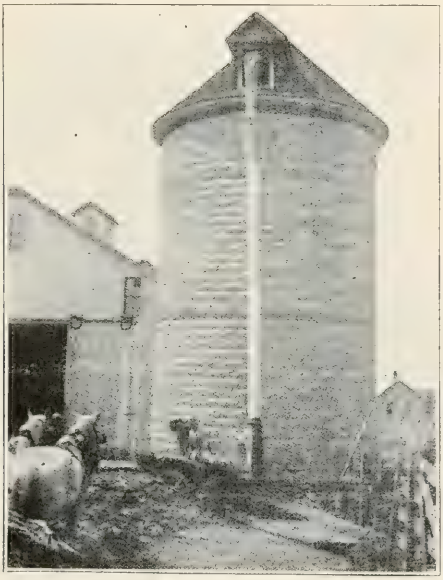

Figure 34. Cement block silo, Hosmer Dairy Farm.

MILK HOUSE.

I have a milk house made entirely of concrete which is 10x12 feet x 6½ feet high of 6-inch walls and 4-inch roof. The house is above the ground. The concrete proportion is 1 cement, 2 sand, and 4 gravel, mixed on a mixing platform made of planks.

The walls extend 18 inches below the surface of the ground; the floor is 6 inches above. The inside frame for the forms, roof and all, was built as a whole, leaving a 6-inch opening in the roof for a ventilating shaft and framing for the door and a window. Upright posts were spaced 2 feet and well braced on both inside and outside forms. The outside forms were built up, two boards at a time, as the concrete work progressed.

This was found to be too warm in the summer time unless the door, which was screened, was left open at nights. By closing the door during the day the temperature remained stationary and cool.

HARRY NEWBRO,
West Plains, Mo.

SUBSTANTIAL FARM RESIDENCE.

The two figures 35 and 36 show some farm cement construction which I have recently completed. In my judgment this is the best form of building, especially in South Missouri, of which I have any knowledge. The farmer himself could build this same house at a saving of probably three hundred or four hundred dollars ($300 or $400) less than it cost me. I had to pay 20 cents per wagon load for the two hundred loads of rock I had gathered up to put into the building. It cost me 35 cents per load for the sand and gravel used—one hundred and sixty-five loads (165). At the time I bought my cement it cost me two dollars and ten cents ($2.10)

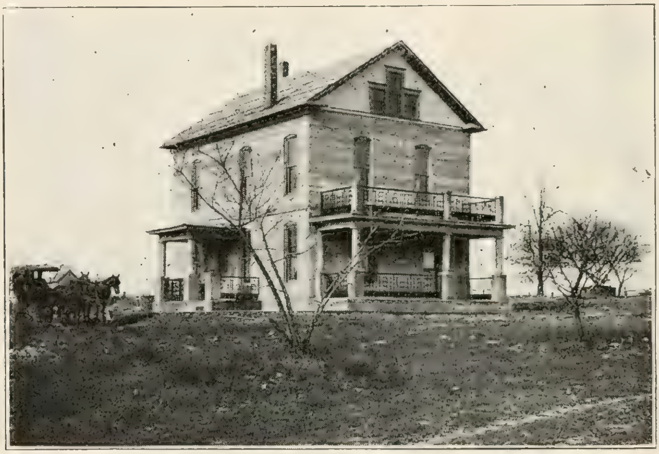

Figure 35. Concrete residence, A. M. Winner, West Plains.

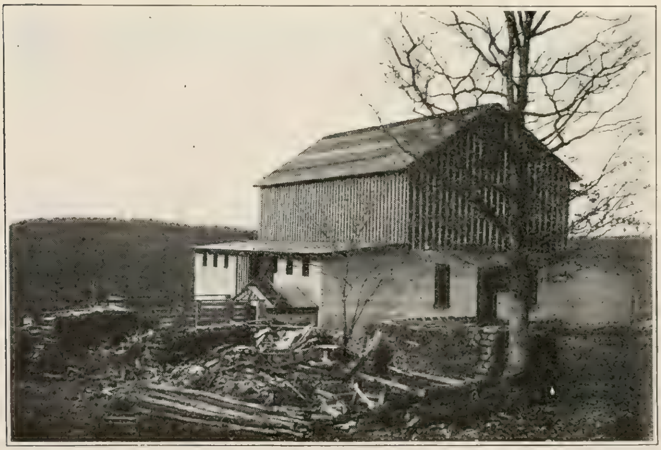

Figure 36. Concrete construction, A. M. Winner.

per barrel landed here, and it cost me 20 cents per barrel to get it hauled out to my farm. It cost me six dollars ($6.00) per thousand to have my lumber hauled from the mill, about thirty (30) miles. I had to pay also for digging cellar, cistern, foundation trenches and all the unskilled labor in mixing and handling the cement. Now the ordinary farmer and his boys could have done at odd times all these things themselves and saved all the money that I had to pay out. The entire lower floor of the house is of cement six inches thick. I find that three or four inches would have been ample. The floor of the dining room and kitchen forms the roof of the double cellar. To support this cement floor I put across a double thickness of American Steel Woven Wire, with a six-inch mesh, covering the entire space with it. I also used thirteen steel wagon tires, which I bought second hand for 30 cents each, turning one foot of each end up into the concrete wall. Some of my farmer neighbors, in giving me advice, felt morally certain that this floor would cave in. Knowing that they would spread their knowledge far and wide, I took the additional precaution of building a sixteen-inch concrete pillar in the center of each cellar. I also had angle bars and many braces of different shapes made out of wagon tires at a very low cost and put one every two or three feet in each corner of the wall; also used them in every other place where there was a possibility of the building settling and forming a crack. My walls are nine inches thick and there is not a crack in the building from top to bottom. I used Portland Cement of the best quality and could now, with my experience, build fully as good a house with twenty-five barrels less of cement than I used. The size of the house, including porches, is thirty-three by fifty-three feet. I built the house on the highest point of the farm, on a bare knoll, so that I could get the air and sunshine and no dampness, and found that it was a success. One hundred feet south of the house I have forty (40) acres of timber, but I get all the shade I want from the porches.

I might mention that the columns of the porches are also of cement and are reinforced by steel boiler tubes three and one-half inches in diameter and eleven feet long, which I bought from a second hand iron man at fifty cents apiece. I also used them for the down spouts of the house and to carry the water underground to the cistern. My cistern is a model and the barn is also a good one.

A. M. WINNER,
West Plains, Mo.

CONCRETE ON DAIRY FARM.

We have used concrete to a limited extent only on our farm, namely:

A manure ditch 6 inches deep, 18 inches wide and 250 feet long at the cow barn, and a concrete floor to the dairy house.

We have built three large concrete watering tanks, two square and one round. The forms for these were made of any old boards that could be worked in. The walls and bottom are 6 inches thick. The concrete was a proportion of 1 cement to 6 clean creek gravel, natural, with a finishing coat of 1 part cement to 2 parts sharp river sand. The reinforcement was old barbed wire, four or five strands twisted together.

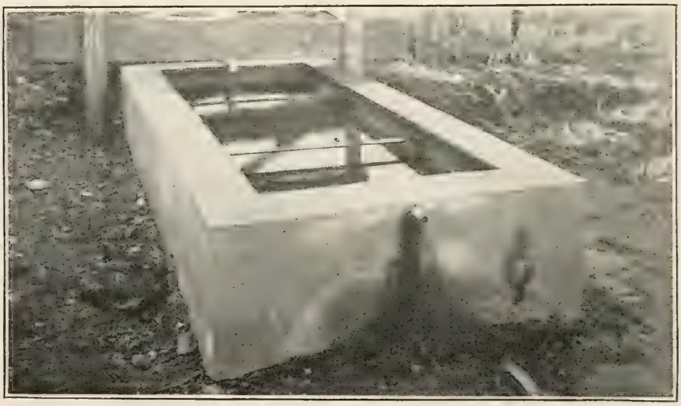

Figure 37. Running watering tank. Note tie bands of iron across interior of tank; outlet for cleaning emtier at the bottom. Tank is 8x3x2 feet, with 8-inch walls. J. F. Short, Caifornia, Mo.

The ingredients were first mixed dry with the cement, water added, and then turned about three times. Water was added until the mixture had the moisture of good plaster mortar and would slip nicely from the shovels. It was well tamped into place. All our concrete work has been in use from 2 to 6 years and is as good as ever.

Yours respectfully,
REDMAN & HURST,
Redhurst Farm, Tipton, Mo.

SILO, BARN FOUNDATION, CULVERTS,

I have a concrete silo 50 feet high, 16 feet in diameter and with a solid 6-inch wall. We excavated 6 feet below the surface of the ground for the foundation and made the circular foundation wall 12 inches thick to the top of the ground. On this we built the silo wall 6 inches thick for the entire height.

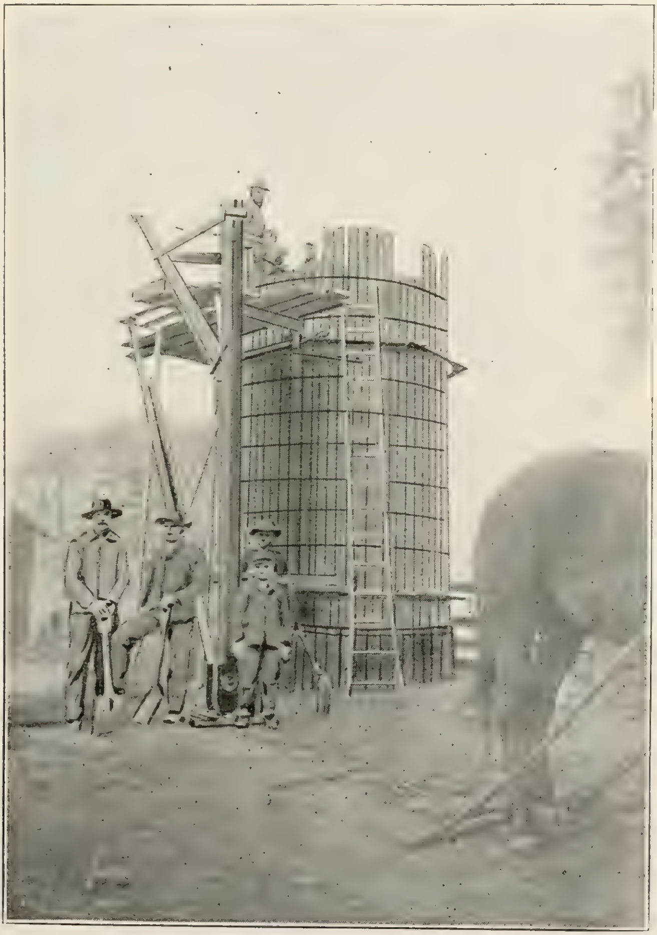

Figure 38. Built by Ed. Zimmerman, Garden City, Mo.

The inside forms were made of ordinary cypress weatherboarding, nailed to 2x4 pieces 8 feet long, and set 2 feet apart around the inside. We had two sets of these 8-foot forms, and as we reached the top of one we would nail to the next, leaving 6 to 8 inches of lap, and plumbing up carefully with a plumb.

The outside form was No. 18, galvanized sheet iron, 18 inches wide and 54 feet long, riveted to an angle iron at one end and bolted to an angle at the other.

The only reinforcement used was one strand of barbed wire each way and 18 inches apart.

The concrete mixture was 1 part cement, 2 parts sand and 4 parts creek gravel. The gravel was hauled from a nearby branch and was screened before using. The cement and sand was first mixed dry and then the gravel wetted and added and the whole wetted and thoroughly mixed.

All work was done with my regular farm force and I have not a detailed cost. The total cost, however, was about $600.00, of which $160.00 was for cement and $40.00 for nails, forms, lumber, etc.

I have fed four crops out of this silo and it has proven efficient, with but one fault to find with it. As the concrete becomes seasoned and dried out, it absorbs some moisture from the ensilage where in contact with it, causing slight loss at the outer side. This, I hope, to overcome before refilling by the use of ''Dehydratine,'' which is reported to make concrete moisture or waterproof, and which may keep it from absorbing moisture from the ensilage.

Aside from the silo, I have foundation walls for a barn and two flat top culverts of concrete. The culverts are each an 8-foot span and 12-foot roadway. The abutments are 18 inches thick at the bottom and 12 inches at the top. The floors are 12 inches thick, reinforced near the bottom with second hand angle irons and American fence wire. The concrete was proportioned the same as for the silo. Both culverts have been in use for some time and are satisfactory. Threshing machine outfits, engine and separator have crossed them without apparently a jar or crack.

In this locality, where we have to haul cement and lumber fourteen miles, but with sand and gravel plentiful in the creeks and branches (and free), the cost of concrete work is from 1½ to 2 times more than wooden structures. Experience teaches me, however, that with the longer life and satisfaction which concrete gives, it is the cheapest for a long time use.

ROBT. E. MITCHELL.
Woodlandville, Mo.

CIRCULAR WATER TANK.

The circular water tank, shown in Fig. 39, is on the farm of H. G. Windsor, Boonville, Mo. The inside diameter is 12 feet. It is

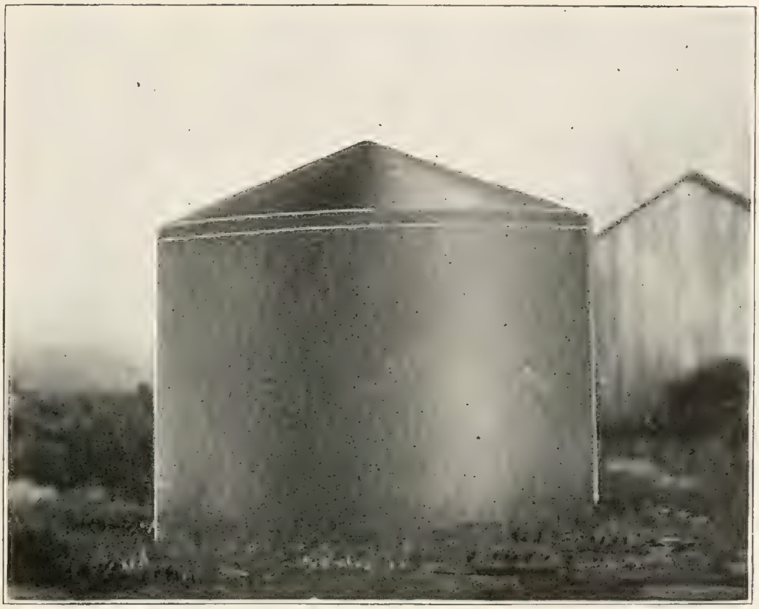

Figure 39. Circular tank, H. G. Windsor, Boonville, Mo.

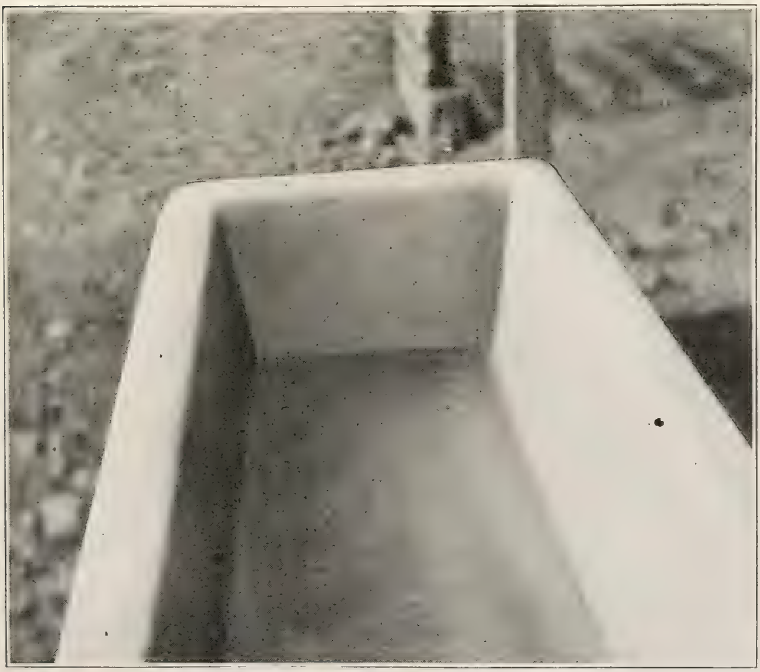

Figure 40. Looking down into empty concrete watering tank.

10 feet high and the wall is 7 inches thick, reinforced with barbed wire—one strand near the outside and one near the inside every foot apart. The foundation is 8 inches of crushed rock on a firm earth. The bottom is 5 inches thick, placed on this 8 inches of tamped broken stone. The mixture is 1 part cement, 2 parts sand and 3 parts clean creek gravel. (Cost $80.00.)

REFLECTIONS

Concrete requires careful proportioning, mixing and curing.

Cement buildings should not be plastered directly upon the concrete wall.

Concrete beams, and any concrete with a span of over 4 feet, should be reinforced.

Build concrete fence posts in a warm shed or in the basement during the winter. They will be better for the weeks of seasoning.

Never apply cement or concrete to a dry or foul surface. Clean and dampen the surface, and if necessary, roughen it.

Use clean water and clean ingredients. Mix thoroughly and put into place at once. Do not guess at measurements and proportions.

Concrete yet in the plastic state must be handled with care. It should be well aged before handling and well set before removing the forms.

For sidewalks and floors use a tamper with a base 10 or 12 inches square, and tamp gently till the water appears on the surface.

Concrete houses will be damp until the concrete has well seasoned. The hollow wall will make a dryer building, warmer in winter and cooler in summer.

Never use cement that has once set. Throw it away or crush it up to be used as aggregate. Never patch concrete if it can be avoided—patch work will sooner or later be seen or become defective.

Cement must be kept perfectly dry. When storing be sure that dampness from the ground or otherwise does not reach it. If exposed for a period in damp weather, cement will absorb moisture from the air and be injured.

When making blocks in the open air, cover the finished blocks with some light cloth to protect them from the air currents and the sun. Never fail to keep the green block moist—let the spraying resemble a mist.

Foundations should become well seasoned and set before the weight of a wall or superstructure is placed upon them. The walls also should be well seasoned before the weight of roof or other parts of the superstructure is put on them.

If the joints between concrete blocks in a building are not pointed up, the rain falling on the outside may enter at the joints. Wash down the monolith walls with waterproofing. Place a waterproofing substance—tar felt or paper—on the foundation to prevent the moisture from penetrating upward into the walls from the ground or basement walls.

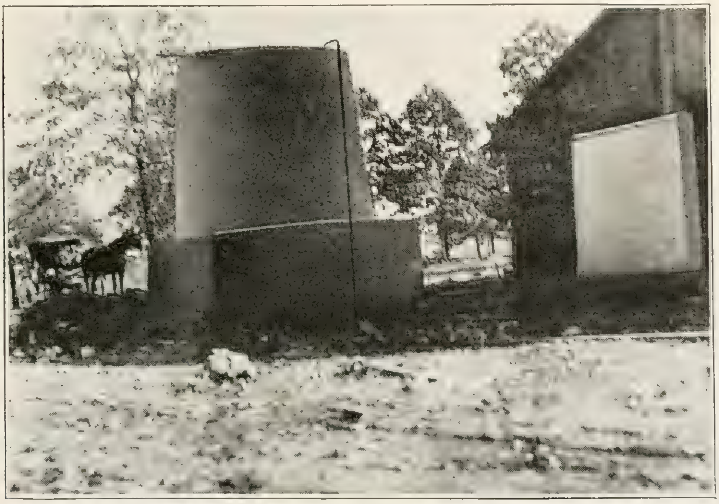

Figure 41. Circular concrete water tank.

Concrete will not give satisfaction if poorly made. It is not "fool-proof," and while expertness is not altogether necessary in the ordinary farm uses, it still requires judgment and some knowledge of workmanship. Care and vigilance are necessary in order to obtain good results. Cheap labor may mean an expensive structure. Unless you know cement, get some one who does until you learn it.

Mixing platforms should be water-tight. It is well to cover the working side with galvanized iron or sheet metal of some kind. Some prefer to have the ends of a platform sloping upwards and sideboards 6 inches or 1 foot high, with rounded corners, thus making a box of it somewhat after the shape of a flat-boat. Six feet wide and 8 feet long, or 8 feet square, is a convenient size for small batches for farm uses.

Fresh concrete should be protected from the weather—hot and dry or the cold. Weather cracks (fine hair cracks), which often appear upon the surface of concrete, can frequently be prevented by keeping the concrete dampened and shaded from the sun for a week. A very rich mixture of mortar or concrete is more liable to these weather cracks than a lean mixture. If well made concrete blocks are kept moistened for a week after making and are then submerged in water for twenty days, crazing is not likely to appear.

Concrete is not everlasting. A good concrete may last for an age, or for ages, but many of the concrete structures now being built will crumble long before many of their most ardent admirers realize. Too much depends upon the quality of the "ingredients"—cement, sand and stone, and upon the method and manner of building, mixing and placing, as well as upon the climatic and other conditions, to say that, ordinarily, concrete has the longevity that some give it. Generally speaking, however, good concrete is as enduring as the most lasting of building materials.

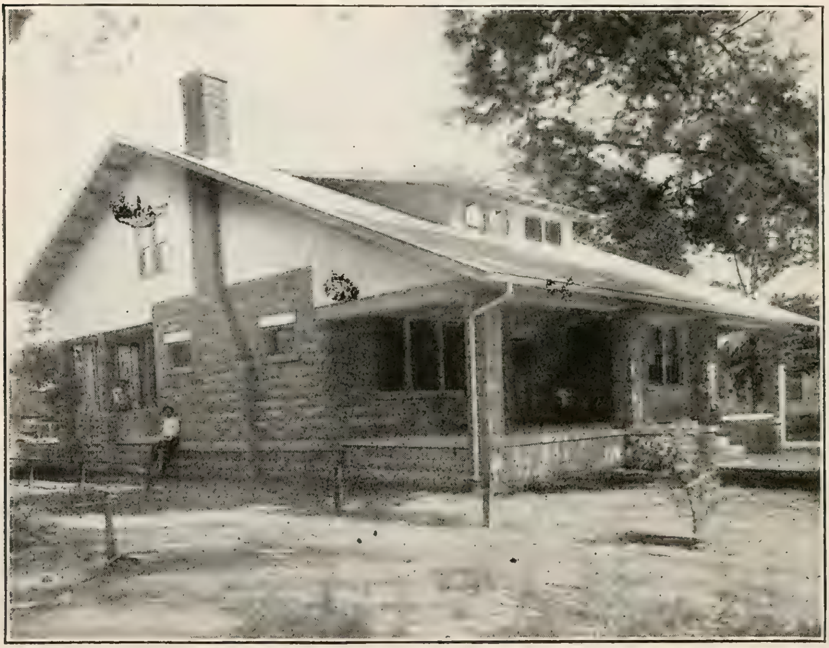

Figure 42. Residence of Col. Moore, Nevada Mo. Concrete block walls, with asbestos shingles on roof and sides, thus making the entire exterior fireproof and enduring. The asbestos shingle is manufactured of mineral fibre, asbestos and cement, and cost, on this roof, $13.50 per square, in place.

CROP REPORTS, HOW AND WHY COMPILED.

(By W. L. Nelson, Assistant Secretary, Missouri State Board of Agriculture.)

Bookkeeper for a million farmers—that's what the Secretary of the Missouri State Board of Agriculture really is, although keeping books is only a part of his business. Each year the Secretary arranges for and directs more than 250 farmers' institutes, issues a monthly bulletin on some agricultural subject and answers several thousand inquiries that have to do with almost every phase of farm life.

As the farmers' bookkeeper, it is the Secretary's duty to issue monthly crop reports during the seeding and growing seasons, and an annual report at the end of each year. The monthly reports, always made public at exactly 12 o'clock noon on the first Saturday in the month, with the exception of the month of December, when the report is issued on the second Saturday, are issued in April, May, June, July, August, September, October and December. A special wheat and oats report is issued in November. The material for all these reports is furnished by some 600 crop correspondents, representing every section and every county in the State. These reporters are representative farmers, chosen because of their honesty and ability to make true and concise reports, and because of their interest in agriculture. They serve the State without pay, receiving in return for their services only the crop reports and other publications of the Board of Agriculture.

On next to the last Thursday in each month preceding the month in which a crop report is to be issued, a list of questions, to be answered, and from which the next report will be made up, is mailed to each correspondent, who is advised as to when his report must be in. As soon as a sufficient number of reports have been received at the Secretary' office in Columbia, the work of tabulation is commenced and continues until all of the reports are in or until the time set for "closing the entries."

It is a noteworthy fact, and one that goes far toward proving the reliability of the reports, that when a dozen or more returns have been received from any section, the average of these may be made and will, after all the correspondents have been heard from, be found to vary but little, if any, from the final figure.

Another proof of the trustworthiness of the crop reports, both State and National, is that with a different set of correspondents, and in some respects a different system of collecting the data, there is seldom, if ever, any great difference. For example, the government report places the value of Missouri's wheat crop for the year 1909 at $29,-

990,000, while the Secretary of the Missouri State Board of Agriculture reports its value at $29,608,414. The value of the Missouri oat crop is placed by the National Government at $8,011,000, and by the State at $7,500,794. The State's corn crop is figured by the National Government to be worth $126,166,000, while the Missouri report places it at $114,844,044. Deduct from the government figures corn's proportionate part (about 90 per cent.) of the $14,000,000 flood loss, which the State sustained during last spring and summer, and practically the same figures result. The State and Government reports are also approximately the same as to the value of farm products. For instance, the government, in giving the value of farm products in Missouri on December 1, last, places corn at 59 cents per bushel, wheat at $1.05, oats at 43 cents, barley at 68 cents, rye at 82 cents and potatoes at 67 cents, tobacco at 13 cents per pound, and hay at $8.30 per ton. The Missouri State Board of Agriculture figures corn at 58.1 cents per bushel, wheat at $1.07, oats at 41 cents, barley at 65 cents, rye at 84 cents and potatoes at 64 cents, tobacco at 13 cents per pound and timothy hay at $8.25 per ton. Comparisons, or rather parallels, like these, tend to give increased confidence in both the Board's and the Bureau's estimates.

The word "estimates," in referring to the crop reports, is used advisedly, for neither the State nor National agricultural departments make any pretense of giving exact figures. Both departments do contend, however, that the figures are more than guesses—that they represent the best, and finally the combined, judgment of hundreds of men best qualified to know. For instance, when the Secretary of the Missouri State Board of Agriculture places the acreage seeded to wheat last fall at 1,923,887, it is not to be understood that the correspondents in each county ascertained the actual number of acres sown on each farm.

Every ten years the National Government reports, following the taking of the census, on the acreage of all crops. This report serves as a valuable "check" for the State Boards, and the percentage of increase or decrease may easily be carried forward from year to year. In Missouri the acreage seeded to wheat in the fall of 1908 was estimated at 1,878,139. Two months ago, when the blanks were sent out for data from which to make up the crop report for December, 1909, one question asked was, "What was the wheat acreage sown compared with that sown last year?" The answers were given in terms of per cent. The replies from each county were averaged so as to get the estimated acreage for the county. Then the county replies from each section were averaged for the sectional average. Finally the sum of all the figures, divided by 114—the number of counties in Missouri—gave as a result 102.4, indicating that the increased acreage amounts to 2.4 per cent. Then multiplying 1,878,139, the original wheat acreage for the fall of 1908, by 102.4, the result is 1,923,887, which figures then become acreage basis for the 1910 wheat crop. All acreages are estimated in this manner.

Yields and prices are reported as the correspondents, by their personal knowledge and by inquiry concerning local conditions, find them. The reports from any given section, when not exactly identical, usually agree very closely, but in order to discover any discrepancy, to account for any ''high'' or ''low,'' and to eliminate any possible land boomer's figures, the returns are ''mapped'' for comparison. That is to say, on blank maps provided for the purpose, the figures are recorded, the returns from each county being written in each county's space on the map. Thus are the returns from counties in the same sections, and where the conditions are similar or identical, brought together so that they may be seen at a glace and careful comparisons made. If there are one or two reports that disagree very materially from practically all the others, an investigation is made to discover the cause. Then if the report still appears radically wrong, or if there seems no good reason why it should be given as it is, it may be necessary to arbitrarily change it to a ''zone average,'' or to discard it entirely. Thus it will be seen that the preparation of a crop report involves more than mere addition and division. The statistician, if he is to do his work intelligently and well, must have a pretty thorough knowledge of crop conditions, soil and farming methods in every section of the State. Rainfall, local floods and perhaps restricted drought districts, all enter in, and his knowledge of these may aid him in reconciling figures which otherwise might be regarded as unreliable. Or, on the other hand, he may, by knowing that a certain small stream overflowed and damaged the growing crops along its banks, be able to understand why the correspondent, whose farm is in that particular bottom, has made such a pessimistic report.

For convenience, the State of Missouri is divided into five crop report sections, as follows:

Northeast Section—Adair, Audrain, Clark, Knox, Lewis, Lincoln, Linn, Macon, Marion, Monroe, Montgomery, Pike, Putnam, Ralls, St. Charles, Schuyler, Scotland, Shelby, Sullivan and Warren.

Northwest Section—Andrew, Atchison, Buchanan, Caldwell, Carroll, Clay, Clinton, Daviess, DeKalb, Gentry, Grundy, Harrison, Holt, Jackson, Lafayette, Livingston, Mercer, Nodaway, Platt, Ray and Worth.

Central Section—Benton, Boone, Callaway, Chariton, Cole, Cooper, Camden, Dallas, Hickory, Howard, Laclede, Maries, Miller, Moniteau, Morgan, Osage, Pettis, Phelps, Pulaski, Randolph and Saline.

Southwest Section—Barry, Barton, Bates, Cedar, Cass, Christian, Dade, Douglas, Greene, Henry, Jasper, Johnson, Lawrence, McDonald, Newton, Ozark, Polk, St. Clair, Stone, Taney, Vernon, Webster and Wright.

Southeast Section—Bollinger, Butler, Cape Girardeau, Carter, Crawford, Dent, Dunklin, Franklin, Gasconade, Howell, Iron, Jefferson, Madison, Mississippi, New Madrid, Oregon, Pemiscot, Perry, Reynolds, Ripley, St. Francois, Ste. Genevieve, St. Louis, Scott, Shannon, Stoddard, Texas, Washington and Wayne.

''What,'' somebody may ask, ''is the good of all these facts and figures? Why should the State issue crop reports? Is anybody benefited?'' These questions might be answered by asking another, ''Why should any business man keep books?'' The crop reports are valuable in many ways. They have a news value, a fact which almost all the daily papers, as well as many of the leading weeklies, are quick to appreciate. They represent an intelligent and unprejudiced discussion of yield and value, and serve as a safe basis for buyer and seller. Many business men depend, to a certain degree, upon these crop reports for future plans. For this reason the reports are given the widest possible publicity, being given out to the press, mailed direct to correspondents and published in condensed form in the year book of the State Board of Agriculture.

Through these reports the buyer knows in a general way of the surplus products produced in any locality and where such products may be found. The prospective purchaser of land, by consulting these reports, is able to get some very valuable and reliable information concerning crop conditions, the output and surplus of the particular county in which he may be interested. No sensible business man would think about buying a business without looking over the books. Farming is a business. Suppose there were no ''farmers' bookkeeper'' for Missouri; suppose the State made no reports and kept no record of crops and conditions. How would the ''Show Me State'' seem in the eyes of the people of other states? One of the most valuable features of the State crop reports is that they make it impossible for unscrupulous speculators to seriously influence the markets by bogus and misleading reports. If the State and National governments did not issue crop reports grain speculators would, and there would be no way, for the time being, to prove them false. For this reason speculators are believed to sometimes try to discredit the department's reports.

It is as matters of record that the crop reports finally become most valuable. A comparison of any crop for a term of years is always interesting, especially now when so much attention is being given to the price of food products and to a study of the relation existing between supply and demand.

If the corn crop for ten years is noted it will be seen that the average yield for the State for that period of time was 28.8 bushels per acre, but that the yield in 1908 was only 26 bushels and in 1909 only 27.4 bushels. The average annual State yield in bushels for the ten-year period is 202,800,185, but in 1908 the total yield was only 173,573,422, and in 1909 it was 197,714,946—both years being below the decade average in yield per acre and total output. The lowest average yield per acre was, in 1901—the drought year—when the records show 9.9 bushels as the State average. The next year all records were broken, with an average of exactly 40 bushels—eight barrels—per acre, for the entire State.

The wheat reports for eight years show the average State yield per acre to have been 13.7 bushels, and the average annual output 31,699,739 bushels. In 1908 the State yield was only 10.7 bushels per acre, considerably below the eight-year average, while in 1909 it was 15.3 bushels, or 1.6 bushels above. But not for three years has Missouri's total output of wheat equaled the eight-year average. The figures are 28,830,014 bushels in 1907; 20,684,819 in 1908, and 27,502,879 in 1909.

When it is remembered that during the last eight or ten years the State's population has greatly increased, these figures, which not only do not show an increase in the output of wheat and corn but for the last two years, indicate a material decrease, we find, if not food to appease hunger, at least, "food for sober study." Corn, while it does not enter so directly into human foodstuffs as does wheat, is yet the principal ration for fattening stock. Most Missouri farmers "market their corn on foot."

Thus it will be seen that it is the duty of the "farmers' bookkeeper" to record unpleasant facts as well as pleasant ones. He must write down the losses as well as the profits. He must be more than a painter of rose-hued pictures.

MISSOURI CROP REVIEW FOR 1909.

(W. L. Nelson, Assistant Secretary State Board of Agriculture.)

The total estimated value of Missouri farm crops for the year 1909 is, according to figures compiled from reports made to the Missouri State Board of Agriculture by its six hundred correspondents, $209,219,478. This is $37,403,925 more than the estimated value of the 1908 crop, which was figured at $171,815,553. In the more than two hundred millions of dollars value for the crops of the year 1909, corn, wheat, oats, tame hay and forage, prairie hay, flax, rye, buckwheat, barley, broomcorn, cotton, potatoes, tobacco, sorghum seed, sorghum syrup, clover seed, timothy seed, kaffir corn, millet, cowpeas, castor beans and other minor crops, also miscellaneous vegetables are included, but live stock, poultry and orchard products are not represented.

The increase for the year comes largely on corn, wheat and oats, but other and less important crops also make a splendid showing.

Corn.—The estimated corn yield for the year 1908, with an acreage of 6,530,410, was 173,573,422 bushels, worth at prices then prevailing $98,607,605. The total yield of corn for the present year (1909) is placed at 197,714,946 bushels on an estimated acreage of 7,205,396. The value of this corn crop is placed at $114,844,044—an average of one million dollars' worth for each county in the State. This crop, measured in money, is the most valuable by several millions of dollars than the State has ever produced. The average yield per acre for the year was 27.4 bushels.

The season of 1909 opened favorably and somewhat earlier than the average. As was pointed out in our April report, the indications were then for an unusually large acreage of corn. The price was high, old corn was scarce, and in a number of counties, especially in the southwestern part of the State, brome sedge, a troublesome weed, best gotten rid of by plowing the ground, had spread over many of the meadows and pastures. Added to this, the preceding fall and winter had been favorable for breaking ground for corn, thirty-two per cent. being broken before spring.

This per cent. was the largest for five years. The soil, except in a few of the northern counties, was in excellent condition for planting. In the extreme southwestern part of the State a little corn was reported planted during the last week in March. During the month of April the condition of the soil, except in a few counties in the southwestern part of the State, was too wet and cold. On May 1 only 59 per cent. of the land had been plowed, the delay being greatest in the northeast and northwest sections. During the month of May planting progressed very satisfactorily, only ten per cent. of the corn remaining unplanted at the close of the month. However, hard rains in many sections had washed the ground and caused a crust to form, so that it was hard for the corn to get through. Cool weather also gave wire worms and cut worms a chance to do considerable damage. Twelve per cent. of the crop had to be planted a second time. In spite of excessive rains in some parts of the State, corn made a satisfactory showing during the month of June.

On August 1 the prospect for a bumper crop, except in a number of counties in the northeast and northwest sections, where the flood loss was very heavy, was the best since 1902. But the flattering prospects were not to be fully realized. A continued and wide-spread drought, which prevailed throughout the State during the entire month, and which was especially severe in the southwest section, doomed to disappointment all who had hopes for a great yield of corn, such as had been promised thirty days before. The condition of corn fell from 88 to 66—a loss of 22 points during those thirty drought days. The drought was broken over most of the State in early September, and the fall season was such as to enable the corn to mature nicely. The quality, though, is but 77.5, as compared with 81 in 1908. The poor quality is due largely to the drought which checked the growth of the corn when it was in the most critical stage—the "roasting ear period."

At the end of the season it was seen that although Missouri had lost more corn by overflows than a dozen states produce and had been hurt by drought, she had still surpassed most other states. Nodaway county, in the northwest section, is the banner corn producing county of the State for the year 1909, its estimated yield being 6,653,778 bushels. The leading county in the central section is Saline, with 6,427,800 bushels. Johnson, with 4,002,801 bushels, leads in the southwest section. Other counties producing more than four million bushels of corn during the year are: Atchison, 5,765,585; Lafayette, 5,078,814; Carroll, 4,247,308. The output of these half-dozen Missouri counties for the one year is 32,176,086 bushels, or more than the combined corn production of eighteen states for the same period.

The farm price of corn, as reported on December 1, ranged generally from 50 to 65 cents per bushel, with a State average of 58.1 cents—2.1 cents above the 1908 price and 13.1 cents more than for

1907. A significant fact is that for the year 1909 not one correspondent reports the farm price below 50 cents per bushel. In a few of the drought-stricken counties of the southwest section a limited number of correspondents report corn selling at from 65 to 75 cents per bushel.

Wheat.—In the production of wheat every section of the State made a decided increase over the 1908 output, the total estimated yield on 1,800,005 acres being 27,502,879 bushels, as compared with 20,684,819 bushels harvested from 1.927,728 acres in 1908. The value of the 1909 wheat crop, figured at $1.07, the average farm price per bushel for the State being $29,608,414, as compared with $19,512,660 for the preceding year.

The condition of the wheat crop on the first of December, 1908, was 79, this being ten points below the five-year average. During the winter, which was characterized by an unusually large number of sudden and decided changes in temperature, there was a lack of snow covering, so that by April 1 the wheat condition had fallen to 70, or 18 points below the five-year average for the same month. An improvement of four points was made during April. The first of June showed a further advance of two points. Harvest came about two weeks late, and improvement immediately preceding cutting was very marked, indicating a much better yield and quality than had been promised a few weeks earlier. The preliminary State estimate for yield, made on July 1, was 14.3 bushels per acre, as compared with a ten-year average of 13.7 bushels. On August 1, when 41.7 per cent. of the crop was reported threshed, the quality was 92.8, as compared with 82 on August 1, 1908. The final figures on the 1909 wheat crop place the average yield for the State at 15.3 bushels per acre, or a bushel better than the preliminary estimate.

The banner wheat county of the State is St. Charles, with an acreage of 51,772, and a total product of 1, 190,756 bushels. The largest wheat-producing county in the southeast section is Franklin, with an acreage of 67,243, and a total product of 1,008,645 bushels. Pike, in the northeast section, produced 753,160 bushels on 43,800 acres. The banner wheat county in Central Missouri is Cooper, with an acreage of 56,420, and a total product of 959,140 bushels. There is but little difference in the total product of Jasper and Lawrence counties in the southwest section, Jasper having an acreage of 50,261 and a yield of 753,915, while Lawrence, with an acreage of 52,151 has a total yield of 730,114 bushels. After Franklin, the largest wheat-producing county in Southeast Missouri, is Scott, with an acreage of 47,317, and a yield of 757,072.

The number of acres seeded to wheat in the fall of 1909 is placed at 1,923,887, a gain of 2.4 per cent. over the original acreage of the preceding year. The increase or decrease of the new wheat acreage, as given by sections, is as follows: Northeast, 15.9 per cent. more; northwest, 10.5 per cent. more; central, 1.1 per cent. more; southwest, 9.8 per cent. less; southeast, 4.4 per cent. more. The condition of the new wheat crop was 93.5 on December 1, as compared with 79 on December 1, 1908, and an average of 81.4 for the five years previous.

Oats.—With only 698,653 acres seeded to oats in 1909, as compared with 717,286 in 1908, the estimated yield was 18,808,576 bushels, an increase of 6,907, 136 bushels over the 1908 crop. This is a gain of approximately 58 per cent. The average yield for entire State was 26.9 bushels per acre, as compared with 16 bushels in 1908. Figuring the crop at the State average of 41 cents per bushel, the value of the oat crop of 1909 was $7,500,794. Northeast Missouri produces more oats than any other section of the State, with Southwest Missouri following. The banner oat county for the year was Knox, with an output of 1,056,750 bushels.

It is interesting to note that the 1909 oat crop, the best in five years and considerably above the seven-year average of 22.6 bushels, was not put in as early as was the crop of 1908, the average yield for which was but 16 bushels per acre. On April 1, 1909, but 52.3 per cent. of the oat crop had been sown, while 88 per cent. of the 1908 crop had been sown by the first of April. This would seem to indicate that a late season for oat seeding does not necessarily mean a light yield, nor early sowing a heavy crop. The condition of the 1909 crop on June 1 was 87, or three points below that of the previous year. There was, however, a very marked improvement during the month of June, the condition on July 1 being 88, as compared with a five-year average of 71. The cold, wet spring rather delayed the growth of the plant, but favorable weather for the last few weeks before harvest made possible a good yield.

Other Crops.—Cool and generally unfavorable weather retarded the growth of grass in some parts of the state last spring, but when cattle and other stock were placed on pasture they made good gains, as the grass was not so "washy" as it often is early in the season. Late summer pastures were cut short by dry weather. Meadows, especially clover meadows, were damaged by the alternate freezing and thawing of the winter and spring, many new meadows being "winter killed." There is also a decided decrease in the output of both clover and timothy seed, due to the smaller acreage threshed, which may be accounted for by the drought which was general throughout the State and most severe in the southwest section.

The cotton acreage and yield for the year 1909 are both a little below the 1908 figures, but the shortage is more than offset by the higher price—13.6 cents per pound, as compared with 8.5 cents last year.

Tobacco shows an increase in acreage of 11 per cent. over that of 1908, when the estimated value of the crop was $244,629, the average yield per acre for that year being 825 pounds, and the price per pound 12 cents. The 1909 leaf tobacco crop is valued at $279,209.

Broomcorn shows considerable increase in yield and a very decided advance in value, the estimated value of the 1908 crop having been only $42,000.

Of the minor crops, and those not generally grown except in limited sections, buckwheat, always a local ''catch crop'' of limited acreage, shows an increase, especially in the flooded districts of the northwest section of the State.

Summary.—The year 1909 has, taken all in all, been a good one for Missouri farmers. In this connection it should be said that better farming as well as a fairly favorable season must be given credit for the very satisfactory showing made. The Missouri farmer is mixing brains with the seed that he sows, and is using his mind as well as his muscles.

In the following pages of this bulletin will be found tables showing acreage, yield and value of the principal crops grown in Missouri in 1909, also tabulations on corn, wheat and oats for a term of years:

NOTE—This article, "Missouri Crop Review for 1909," is a reprint from the December bulletin issued by the State Board of Agriculture. It is here reproduced in order to meet the demand for the information contained therein, and to place in more permanent form important agricultural statistics. Had Missouri a state statistical law, such as the Board has advocated, it would be possible to make our crop statistics much more complete and possibly more accurate.

CORN, HAY AND FORAGE.

Table giving acreage, average yield per acre, and total product of corn and of hay and forage, by counties, for the year 1909.

	Corn.			Hay and Forage.	
	Acres planted..	Average yield per acre, bushels	Total yield per county, bushels.	Acres..........	Total yield per county, tons....
State......................	7,205,396	27.4	197,714,946	3,444,714	4,372,766
County.					
Adair......................	62,296	29	1,806,584	73,309	80,639
Audrain....................	129,048	28	3,613,344	60,843	60,843
Andrew.....................	99,404	27	2,683,908	29,251	43,876
Atchison...................	164,731	35	5,765,585	18,952	30,323
Barry......................	55,070	21	1,156,470	16,740	20,925
Barton.....................	106,676	24	2,560,224	28,569	31,425
Bates......................	153,326	20	3,066,520	66,248	72,872
Benton.....................	52,554	27	1,418,958	30,081	33,089
Bollinger..................	33,074	28	926,072	11,891	17,836
Boone......................	79,195	33	2,613,435	53,570	85,712
Buchanan...................	62,789	32	2,009,248	20,600	30,900
Butler.....................	20,807	25	520,175	7,590	11,385
Caldwell...................	87,944	23	2,022,712	45,961	73.537
Callaway...................	80,930	30	2,427,900	52,468	78,702
Camden.....................	26,900	28	753,200	12,198	15,247
Cape Girardeau.............	31,732	30	951,960	23,611	40,138
Carroll....................	151,761	28	4,249,308	51,534	77,301
Carter.....................	11,238	23	258,474	2,436	2,436
Cass.......................	110,853	21	2,327,913	70,322	98,450
Cedar......................	52,953	20	1,059,060	17,480	20,976
Chariton...................	66,011	31	2,046,341	54,488	68,110
Christian..................	48,985	26	1,273,610	14,606	16,066
Clark......................	76,797	22	1,689,534	53,625	75,075
Clay.......................	77,688	31	2,408,328	22,511	31,515
Clinton....................	105,479	28	2,953,412	37,780	47,225
Cole.......................	24,377	34	828,818	19,722	24,652
Cooper.....................	80,397	37	2,974,689	25,851	33,606
Crawford...................	29,742	25	743,550	14,950	16,445
Dade.......................	59,717	20	1,194,340	18,700	22,440
Dallas.....................	49,382	25	1,234,550	20,160	18,144
Daviess....................	101,968	21	2,141,328	59,235	77,005
DeKalb.....................	115,621	26	3,006,146	42,884	53,605
Dent.......................	31,062	25	776,550	17,420	20,904
Douglass...................	41,382	22	901,404	15,237	11,427
Dunklin....................	46,512	32	1,488,384	5,750	6,325
Franklin...................	45,284	36	1,630,224	27,600	41,400
Gasconade..................	18,357	29	532,353	14,329	21,493
Gentry.....................	81,897	22	1,801,734	52,495	73,493

CORN, HAY AND FORAGE—Continued.

	Corn.			Hay and Forage.	
	Acres planted..	Average yield per acre, bushels	Total yield per county, bushels	Acres..........	Total yield per county, tons....
Greene....................	78,360	25	1,959,000	27,720	27,720
Grundy....................	76,103	25	1,902,575	59,896	95,833
Harrison....................	122,689	23	2,281,847	81,057	101,321
Henry....................	116,748	24	2,801,952	40,887	44,975
Hickory....................	32,882	21	609,522	17,010	18,711
Holt....................	97,286	33	3,210,438	12,285	17,199
Howard....................	42,283	36	1,522,188	27,240	34,050
Howell....................	51,342	22	1,129,524	13,000	13,000
Iron....................	14,943	22	328,746	9,135	11,418
Jackson....................	111,275	31	3,449,525	44,283	61,196
Jasper....................	81,862	30	2,455,860	20,350	28,490
Jefferson....................	43,392	34	1,475,328	20,542	25,677
Johnson....................	121,297	33	4,002,801	57,718	63,489
Knox....................	65,585	28	1,836,380	61,383	79,797
Laclede....................	37,037	29	999,999	26,751	32,101
Lafayette....................	130,226	39	5,078,814	40,330	68,561
Lawrence....................	71,110	22	1,564,420	13,190	16,487
Lewis....................	53,570	28	1,499,960	50,597	58,186
Lincoln....................	83.620	35	2,926,700	22,866	32,012
Linn....................	89,636	22	1,971,992	83,566	104,457
Livingston....................	68,825	25	1,720,625	50,650	75,975
McDonald....................	28,010	21	588,210	9,570	11,484
Macon....................	85,454	29	2,478,166	89,121	98,033
Madison....................	15,601	24	374,424	11,319	14,148
Maries....................	24,518	23	563,914	13,420	18,788
Marion....................	53,939	32	1,726,048	31,488	36,211
Mercer....................	54,846	24	1,316,304	58,630	73,287
Miller....................	31,819	24	763,656	18,293	22,866
Mississippi....................	38,250	30	1,147,500	4,917	5,900
Moniteau....................	44,374	30	1,331,220	26,775	32,130
Monroe....................	106,191	26	2,760,966	56,868	71,085
Montgomery....................	70,492	31	2,185,252	27,304	30,034
Morgan....................	38,908	29	1,128,332	25,166	27,682
New Madrid....................	41,604	30	1,248,120	3,001	3,601
Newton....................	46,670	23	1,073,410	12,650	15,180
Nodaway....................	214,638	31	6,653,778	62,150	99,440
Oregon....................	24,490	23	563,270	5,687	7,108
Osage....................	27,404	32	876,928	15,247	19,821
Ozark....................	29,022	20	580,440	3,853	2,889
Pemiscot....................	18,316	31	567,796	1,123	1,459
Perry....................	23,849	30	715,470	12,346	14,815
Pettis....................	115,265	32	3,688,480	43,356	52,027
Phelps....................	28,988	23	666,724	17,743	23,065
Pike....................	79,059	26	2,055,534	43,811	54,763
Platte....................	51,383	33	1,695,639	14,250	22,800

CORN, HAY AND FORAGE—Continued.

	Corn.			Hay and Forage.	
	Acres planted...	Average yield per acre, bushels	Total yield per county, bushels	Acres..........	Total yield per county, tons....
Polk	59,055	20	1,181,100	32,789	29,510
Pulaski	30,346	26	788,996	13,570	17,641
Putnam	55,885	22	1,229,470	71,148	78,262
Ralls	68,463	26	1,780,038	35,200	49,280
Randolph	63,703	31	1,974,793	24,897	29,876
Ray	137,759	27	3,719,493	42,447	63,670
Reynolds	13,959	22	307,098	9,166	9,166
Ripley	26,818	22	589,996	5,267	5,267
Saline	178,550	36	6,427,800	34,295	42,868
Schuyler	35,812	23	823,676	40,700	50,877
Scotland	62,869	32	2,011,808	50,401	55,441
Scott	33,319	31	1,032,889	7,384	9,230
Shannon	20,989	22	461,758	5,753	5,753
Shelby	83,890	30	2,516,700	48,478	77,564
Stoddard	54,439	31	1,687,609	8,452	10,987
Stone	30,761	20	615,220	7,750	6,975
St. Charles	35,178	43	1,512,654	19,320	32,844
St. Clair	72,645	20	1,452,900	29,623	26,660
St. Francois	18,153	24	435,672	15,140	15,140
Ste. Genevieve	15,058	30	451,740	9,691	12,113
St. Louis	32,564	39	1,269,996	33,663	40,395
Sullivan	68,284	22	1,502,248	97,026	116,431
Taney	26,722	20	534,440	3,722	3,722
Texas	51,356	20	1,027,120	27,720	24,938
Vernon	156,175	21	3,279,675	62,883	69,171
Warren	23,784	36	856,224	11,143	16,714
Washington	29,769	21	625,149	12,586	15,732
Wayne	26,482	24	635,568	11,403	14,253
Webster	45,253	22	995,566	24,874	22,386
Worth	51,486	23	1,184,178	27,342	43,747
Wright	38,770	25	969,250	21,340	21,340

WHEAT AND OATS.

Table giving acreage, average yield per acre, and total product of wheat and oats, by counties for the year 1909.

	Wheat.			Oats.		
	Acreage........	Average yield per acre, bushels	Total yield per county, bushels	Acreage........	Average yield per acre, bushels	Total yield per county, bushels
State........................	1,801,005	15.3	27,502,879	698,653	26.9	18,808,576
County.						
Adair........................	2,148	17	36,516	3,640	25	91,000
Audrain......................	907	20	18,140	22,911	25	572,775
Andrew.......................	4,741	20	94,820	5,793	31	179,585
Atchison.....................	5,549	20	110,980	22,938	30	688,140
Barry........................	26,843	12	322,116	4,830	30	144,900
Barton.......................	10,198	13	132,574	9,760	35	341,600
Bates........................	16,360	14	229,040	14,815	24	355,560
Benton.......................	11,717	14	164,038	7,463	25	186,575
Bollinger....................	16,656	12	199,872	4,565	30	136,950
Boone........................	22,368	15	335,520	7,236	28	202,610
Buchanan.....................	28,868	20	577,360	3,595	25	89,875
Butler.......................	767	15	11,505	1,505	25	37,625
Caldwell.....................	1,731	15	25,965	2,800	28	78,400
Callaway.....................	26,408	17	448,936	11,456	30	343,680
Camden.......................	5,793	12	69,516	3,289	24	78,936
Cape Girardeau...............	39,153	12	469,836	5,725	29	166,025
Carroll......................	18,457	17	313,769	6,521	30	195,630
Carter.......................	1,152	8	9,216	540	20	10,800
Cass.........................	16,052	16	256,832	13,820	28	386,960
Cedar........................	7,290	11	80,190	7,770	22	170,940
Chariton.....................	23,596	15	353,940	4,125	30	123,750
Christian....................	19,227	14	269,178	4,160	27	112,320
Clark........................	7,011	18	126,198	29,989	28	839,690
Clay.........................	5,208	16	83,328	2,038	28	57,065
Clinton......................	1,615	15	24,225	4,885	25	122,125
Cole.........................	33,090	17	562,530	3,785	30	113,550
Cooper.......................	56,420	17	959,140	7,440	26	193,440
Crawford.....................	12,294	10	122,940	1,710	24	41,040
Dade.........................	18,763	15	281,445	8,540	30	256,200
Dallas.......................	8,394	10	83,940	5,690	23	130,870
Daviess......................	4,387	12	52,644	2,985	27	80,595
DeKalb.......................	1,778	15	26,670	3,710	25	92,750
Dent.........................	10,547	10	105,470	1,650	20	33,000
Douglas......................	15,634	10	156,340	2,420	25	60,500
Dunklin......................	3,331	18	59,958	825	25	20,625
Franklin.....................	67,243	15	1,008,645	6,130	26	159,380
Gasconade....................	29,126	15	436,890	4,130	25	103,250
Gentry.......................	1,467	14	20,538	5,460	27	147,420

WHEAT AND OATS—Continued.

	Wheat.			Oats.		
	Acreage	Average yield per acre, bushels	Total yield per county, bushels	Acreage	Average yield per acre, bushels	Total yield per county, bushels
Greene	33,549	16	536,784	12,914	34	439,075
Grundy	2,735	17	46,495	2,405	30	72,150
Harrison	1,971	14	27,594	8,762	27	236,575
Henry	24,053	15	360,795	16,620	23	382,260
Hickory	5,329	12	63,948	4,100	24	98,400
Holt	7,009	20	140,180	14,328	26	372,530
Howard	37,221	14	521,094	1,655	25	41,375
Howell	12,879	12	154,548	2,420	22	53,240
Iron	1,768	12	21,216	1,000	20	20,000
Jackson	15,419	17	262,123	5,960	30	178,800
Jasper	50,261	15	753,915	13,680	34	465,120
Jefferson	18,279	15	274,185	2,085	27	56,295
Johnson	32,497	16	519,952	8,450	30	253,500
Knox	1,405	16	22,480	48,034	22	1,056,750
Laclede	4,411	11	48,521	3,770	22	82,940
Lafayette	39,863	17	677,671	11,515	30	345,450
Lawrence	52,151	14	730,114	10,945	34	372,130
Lewis	3,867	17	65,739	5,580	22	122,760
Lincoln	34,750	19	660,250	11,314	24	271,536
Linn	3,422	16	54,752	3,564	31	110,485
Livingston	6,862	16	109,792	3,475	30	104,250
McDonald	12,254	11	134,794	1,695	25	42,375
Macon	4,665	12	55,980	3,677	30	110,310
Madison	4,965	12	59,580	1,022	25	25,550
Maries	12,231	11	134,541	2,454	30	73,620
Marion	14,006	17	238,102	2,640	22	58,080
Mercer	1,829	14	25,606	3,935	25	98,375
Miller	12,295	13	159,835	3,885	30	116,550
Mississippi	24,471	17	416,007	135	25	3,375
Moniteau	23,986	16	383,776	6,030	30	180,900
Monroe	7,526	18	135,468	10,480	24	251,520
Montgomery	19,816	18	356,688	13,930	22	306,460
Morgan	12,182	15	182,730	5,015	30	150,450
New Madrid	9,882	18	177,876	293	25	7,325
Newton	30,310	14	424,340	6,040	28	169,120
Nodaway	4,229	18	76,122	18,565	28	519,820
Oregon	7,923	8	63,384	1,620	20	32,400
Osage	24,270	14	339,780	2,140	30	64,200
Ozark	8,268	10	82,680	1,325	22	29,150
Pemiscot	4,959	20	99,180	68	25	1,700
Perry	44,795	13	582,335	4,240	30	127,000
Pettis	21,666	14	303,324	5,910	30	177,300
Phelps	9,278	11	102,058	3,880	20	77,600
Pike	43,804	20	876,080	12,975	28	363,300
Platte	37,658	20	753,160	2,368	30	71,040

WHEAT AND OATS—Continued.

	Wheat.			Oats.		
	Acreage..........	Average yield per acre, bushels	Total yield per county, bushels	Acreage..........	Average yield per acre, bushels	Total yield per county, bushels
Polk........................	17,137	12	205,644	9,900	22	217,800
Pulaski.....................	8,266	11	90,926	2,273	22	50,005
Putnam......................	1,558	12	18,696	6,245	28	174,860
Ralls.......................	9,681	18	174,258	6,156	25	153,900
Randolph....................	3,300	14	46,200	3,190	27	86,130
Ray.........................	8,660	17	147,220	2,633	28	73,724
Reynolds....................	1,968	10	19,680	710	20	14,200
Ripley......................	5,030	8	40,240	3,619	25	90,475
St. Charles.................	51,772	23	1,190,756	8,245	35	288,575
St. Clair...................	7,185	12	86,220	7,045	25	176,125
Ste. Genevieve..............	21,094	14.5	305,863	965	20	19,300
St. Francois................	9,353	13	121,589	1,100	20	22,000
St. Louis...................	47,205	16	755,280	2,330	28	65,240
Saline......................	48,764	16	780,224	7,505	30	225,150
Schuyler....................	2,056	14	28,784	5,927	25	148,175
Scotland....................	1,025	18	18,450	10,765	28	301,420
Scott.......................	47,317	16	757,072	220	25	5,500
Shannon.....................	2,479	10	24,790	823	20	16,460
Shelby......................	11,125	13	144,625	7,510	24	180,240
Stoddard....................	23,356	14	326,984	2,285	22	50,270
Stone.......................	7,416	10	74,160	1,365	25	34,125
Sullivan....................	698	17	11,866	2,495	30	74,850
Taney.......................	4,988	10	49,880	1,480	22	32,560
Texas.......................	14,477	10.5	152,008	3,382	20	67,640
Vernon......................	9,191	13	119,483	11,353	27	306,530
Warren......................	21,212	18	381,816	7,058	30	211,740
Washington..................	9,763	14	136,682	1,786	30	53,580
Wayne.......................	5,353	10	53,530	1,200	22	26,400
Webster.....................	15,292	14	214,088	5,470	25	136,750
Worth.......................	1,205	20	24,100	3,375	29	97,875
Wright......................	13,221	11	145,431	2,700	25	67,500

SUMMARY OF THE ACREAGE, YIELD AND VALUE OF FARM CROPS FOR THE YEAR 1909 FOR THE STATE AND BY SECTIONS.

CORN.

Section.	Acres planted.	Average yield per acre, bu.	Total yield, bushels.	Total value.
Northeast	1,389,852	27.9	38,783,278	$22,442,122
Northwest	2,165,798	28.5	61,794,925	36,585,579
Central	1,155,823	30.8	35,640,443	19,983,594
Southwest	1,631,422	23.	37,593,785	21,634,061
Southeast	862,501	26.7	23,902,515	14,198,688
State	7,205,396	27.4	197,714,946	$114,844,044

WHEAT.

Section.	Acres sown.	Acres harvested.	Average yield per acre, bu.	Total yield, bushels.	Total value.
Northeast	249,053	242,454	19	4,615,644	$5,053,523
Northwest	219,834	201,241	18	3,620,362	3,731,647
Central	427,067	410,985	15	6,134,517	6,462,415
Southwest	466,410	447,740	14	6,165,995	6,634,534
Southeast	515,775	497,585	13	6,966,361	7,726,295
State	1,878,139	1,800,005	15.3	27,502,879	$29,608,414

WHEAT SOWN, FALL 1909.

Section.	Acreage sown, 1909.	Acreage compared with previous year, per cent.	Average condition, crop, Dec. 1, 1909.	Previous five-year average con. Dec. 1, 1909.
Northeast	288,832	115.9	93.5	82.8
Northwest	243,055	110.5	94.	83.4
Central	432,091	101.1	92.8	83.4
Southwest	421,104	90.2	93.3	84.5
Southeast	538,805	104.4	94.2	81.8
State	1,923,887	102.4	93.6	83.2

OATS.

Section.	Acres harvested.	Average yield per acre, bu.	Total yield, bushels.	Total value.
Northeast	223,135	25.5	5,688,426	$2,130,990
Northwest	138,047	28.	3,902,174	1,539,796
Central	102,291	27.3	2,978,031	1,153,889
Southwest	177,097	27.9	4,953,100	1,993,928
Southeast	58,083	25.2	1,466,845	682,191
State	698,653	26.9	18,808,576	$7,500,794

TAME HAY AND FORAGE.

Section.	Acres harvested.	Average yield per acre, tons.	Total yield, tons.	Total value.
Northeast	1,028,197	1.2	1,258,548	$10,385,835
Northwest	874,523	1.4	1,261,809	10,670,802
Central	572,301	1.3	728,888	6,122,379
Southwest	616,821	1.1	685,059	5,721,386
Southeast	352,872	1.2	438,462	4,895,709
State	3,444,714	1.2	4,372,766	$37,796,111

PRAIRIE HAY.

Section.	Acres harvested.	Average yield per acre, tons.	Total yield, tons.	Total value.
Northeast	16,709	1.4	23,392	$122,811
Northwest	33,848	1.5	50,772	355,404
Central	15,496	1.1	17,045	140,626
Southwest	99,679	1.2	119,614	747,592
Southeast	2,213	1.1	2,434	17,040
State	167,945	1.3	233,257	$1,383,473

SUMMARY OF TOTAL YIELD AND VALUE OF FARM CROPS PRODUCED BY MISSOURI FARMERS IN THE YEAR 1909.

	Acreage.	Yield.	Value.
Corn	7,205,396	197,714,946	$114,844,044
Wheat	1,800,005	27,502,879	29,608,414
Oats	698,653	18,808,576	7,500,794
Tame hay and forage	3,444,714	4,372,766	37,796,111
Prairie Hay	167,945	233,259	1,383,473
Flax	14,640	140,544	177,085
Rye	10,500	145,950	122,598
Buckwheat	2,149	32,235	27,077
Barley	1,430	31,317	20,356
Broomcorn	3,800	2,147,000	182,410
Cotton	75,135	23,742,660	3,229,001
Potatoes	77,774	6,189,694	3,961,404
Tobacco	2,743	2,147,769	279,209
Sorghum seed	22,037	396,681	353,046
Sorghum syrup	22,037	1,829,071	823,081
Clover seed	35,396	60,173	421.211
Timothy seed	44,092	143,313	305,822
Kaffir corn, millet, cowpeas, castor beans, etc			1,101,600
Miscellaneous vegetables			7,087,500
Total value of all crops			$209,219,478

CROP YIELDS, 1909.

AVERAGE PER ACRE BY CROP SECTIONS.

Crop.	N. E. Sec. 20 counties.	N. W. Sec. 21 counties.	Cent. Sec. 21 counties.	S. W. Sec. 23 counties.	S. E. Sec. 29 counties.	Whole State, 114 counties.
Corn, bushels	27.9	28.5	30.8	23	26.7	27.4
Wheat, bushels	19	18	15	14.	13.	15.3
Oats, bushels	25.5	28	27.3	27.9	25.2	26.9
Hay Timothy, tons	1.4	1.4	1.2	1.2	1.2	1.3
Prairie, tons	1.4	1.5	1.1	1.2	1.1	1.3
Clover, tons	1.5	1.2	1.4	1.3	1.3	1.35
Alfalfa, tons	1.6	1.5	1.6	1.3	1.8	1.5
Cowpea, tons	1.5	1.6	1.5	1.4	1.6	1.5
Flax	....	....	....	....	....	9.6
Rye, bushels	15.6	16.4	13.6	11.6	12.2	13.9
Buckwheat, bushels	15	20	21	11	8	15
Barley, bushels	....	....	....	....	....	21.9
Broomcorn, lbs	....	....	750	612	333	565
Cotton (lint), lbs	....	....	....	....	316	316
Potatoes, bushels	81	94	85	73	74	81
Tobacco, lbs	....	....	....	....	....	783
Sorghum syrup, gallons	82	96	84	73	81	83
Sorghum seed, bushels	16	23	15	21	14.5	18
Kaffir corn, bushels	35	35	24	21.6	23	27.7
Cowpeas, bushels	13	14	14	11	16	13.6
Clover seed, bushels	1.8	1.7	1.8	1.7	1.9	1.7
Timothy seed, bushels	3	3.8	3.7	3.5	3	3.4

AVERAGE FARM PRICE DECEMBER 1, 1909.

The prices given in this table are governed by local conditions, and are the current local prices prevailing in the country.

	N. E.	N. W.	Central.	S. W.	S. E.	State.
Corn, per bushel	$ .57	$ .59	$ .57	$ .57	$ .59	$ .581
Wheat, per bushel	1.09	1.03	1.05	1.08	1.11	1.07
Oats, per bushel	.39	.39	.41	.40	.46	.41
Flax, per bushel	....	....	....	....	....	1.26
Timothy seed, per bushel	1.78	1.82	2.18	2.08	2.37	2.04
Clover seed, per bushel	6.72	7.41	6.50	7.25	7.22	7.00
Cowpea seed, per bushel	1.75	1.75	1.76	1.70	1.45	1.68
Sorghum seed, per bushel	.87	.87	.90	.86	.94	.89
Kaffir corn, per bushel	.66	.80	.72	.74	.96	.78
Rye, per bushel	.73	.77	.85	.93	.90	.84
Buckwheat, per bushel	.87	.83	1.02	.73	.75	.84
Barley, per bushel	.65	.70	.70	.55	.65	.65
Potatoes, per bushel	.60	.62	.60	.68	.69	.64
Sweet potatoes, per bushel	1.03	1.07	.91	1.02	.75	.96
Winter apples, per bushel	.73	.62	.71	.90	.92	.78
Timothy hay, per ton	8.70	8.25	8.50	8.80	12.50	9.35
Clover hay, per ton	8.00	7.90	8.20	8.35	10.00	8.49
Alfalfa hay, per ton	12.00	10.60	10.00	10.00	12.15	10.95
Cowpea hay, per ton	11.50	9.00	7.15	7.90	9.65	9.04
Prairie hay, per ton	5.25	7.00	8.25	6.25	7.00	6.75
Broomcorn brush, per ton	....	....	150.00	160.00	200.00	170.00
Cotton lint, per lb	....	....	....	....	....	.136
Leaf tobacco, per lb	.13	.14	.13	.12	.13	.13
Wool, per lb	.26	.25	.25	.25	.25	.25

LIVE STOCK—AVERAGE FARM PRICE PER HEAD DECEMBER 1, 1909.

	N. E. Sec.	N. W. Sec.	Cent. Sec.	S. W. Sec.	S. E. Sec.	State
Horses.						
Spring colts	$59.	$57.	$52.	$53.	$49.	$54.
Yearlings	90.	84.	75.	77.	71.	79.
Two years and over	119.	122.	121.	109.	104.	115
Mules.						
Spring colts	74.	74.	67.	68.	59.	68.
Yearlings	101.	107.	96.	95.	84.	97.
Two years and over	140.	147.	133.	136.	126.	136.
Cattle.						
Steer calves	16.25	15.	14.10	12.	9.50	13.35
Heifer calves	13.	12.	11.75	9.95	8.60	11.05
Yearling steers	25.40	24.25	21.80	20.20	14.75	21.50
Yearling heifers	20.45	19.70	18.50	16.60	13.25	17.70
Steers, 2 years and over	36.15	35.40	32.65	30.20	23.60	31.60
Cows, 2 years and over	37.90	41.50	35.85	34.80	31.50	36.30
Sheep.						
Lambs under 1 year	3.90	4.00	3.70	4.10	3.20	3.80
All other sheep	5.00	5.20	4.45	5.20	3.95	4.75

FARM PRODUCE—PRICE PER POUND OR DOZEN.

	N. E. Sec.	N. W. Sec.	Cent. Sec.	S. W. Sec.	S. E. Sec.	State.
Chickens.						
Average price per lb	.10	.095	.095	.095	.095	.096
Turkeys.						
Average price per lb	.145	.145	.135	.13	.13	.137
Eggs and Butter.						
Eggs, per dozen	.25	.24	.235	.225	.24	.238
Butter, per lb	.23	.24	.215	.23	.23	.229

LIVE STOCK—CONDITION AS TO THRIFT AND HEALTH DEC. 1, 1909.

	N. E. Sec.	N. W. Sec.	Cent. Sec.	S. W. Sec.	S. E. Sec.	State.
Cattle	99.3	97.4	94.3	95.3	95.1	96.3
Horses	97.1	95.	93.6	94.8	95.1	95.1
Mules	97.8	96.2	96.1	97.	96.3	96.7
Hogs	96.2	91.	92.8	94.1	94.4	93.7
Sheep	94.8	92.4	89.8	94.4	92.	92.7

TABLE SHOWING CONDITION, ACREAGE, YIELD AND VALUE OF CORN IN MISSOURI FOR TEN YEARS.

Corn.	Condition, per cent.						Part planted per cent.		Safe from frost per cent. Oct. 1	Harvested for fodder, per cent October 1	Acres planted.	Average yield per acre, bu.	Total yield, bushels.	Total value
	May	June	July	August	September	October	May 1	June 1						
1900—Northeast	95	99	100	93	76	......	42	95	......	......	926,000	30	27,780,000	......
Northwest	94	97	104	91	87	......	25	95	......	......	1,937,000	33	63,921,000	......
Central	85	92	99	101	78	......	50	98	......	......	1,055,000	30	31,650,000	......
Southwest	93	92	98	98	77	......	80	98	......	......	1,677,000	28	46,956,000	......
Southeast	85	90	87	95	71	......	51	93	......	......	820,000	28	22,960,000	......
State	90	94	98	96	78	......	50	96	......	......	6,415,000	29.4	193,267,000	......
1901—Northeast	......	77	83	25	29	39	......	91	80	......	935,000	11	10,285,000	......
Northwest	......	87	76	31	34	38	......	94	78	......	1,956,000	15	29,380,000	......
Central	......	69	54	15	25	29	......	87	82	......	949,000	7	6,603,000	......
Southwest	......	76	63	13	22	24	......	97	91	......	1,626,000	6	9,556,000	......
Southeast	......	75	69	23	26	30	......	83	72	......	763,000	8	6,104,000	......
State	......	77	69	21	27	32	......	90	81	......	6,229,000	9.9	61,667,000	......
1902—Northeast	93	98	102	101	114	......	67	......	......	23	1,509,000	43.3	65,340,000	$19,994,000
Northwest	92	100	100	107	114	......	53	......	......	24	2,363,000	43.6	103,026,000	32,350,000
Central	89	96	100	102	112	......	79	......	......	34	1,171,000	41.3	48,321,000	14,255,000
Southwest	89	75	95	102	109	......	73	......	......	27	1,731,000	35.5	61,451,000	19,480,000
Southeast	88	95	96	91	92	......	68	......	......	48	919,000	31.8	29,226,000	10,960,000
State	90	97	99	101	108	......	68	......	......	31	7,693,000	40	307,364,000	97,039,000
1903—Northeast	......	81	72	67	72	74	7	85	65	33	1,334,630	27.9	37,303,925	12,785,675
Northwest	......	71	71	69	80	80	11	80	69	28	2,141,170	33.2	71,089,275	24,518,000
Central	......	78	74	72	83	82	30	86	78	38	1,153,205	33.2	38,349,270	13,142,705
Southwest	......	60	63	66	70	74	44	68	79	35	1,523,990	24.1	36,723,995	13,600,425
Southeast	......	82	79	84	82	85	42	89	84	42	882,265	29.6	26,178,365	10,628,365
State	......	74	72	72	77	79	27	82	75	35	7,035,560	29.8	209,644,830	74,675,170
1904—Northeast	69	74	78	75	76	80	1	70	60	38	1,245,125	29.8	37,117,605	14,637,230
Northwest	75	69	70	68	72	72	8	69	63	29	1,994,330	26.1	51,899,065	21,278,220
Central	57	70	70	67	67	73	13	73	72	46	1,073,890	26.6	28,608,015	12,997,700
Southwest	58	72	77	70	78	74	51	83	83	42	1,473,180	21	31,000,910	13,049,560

TABLE SHOWING CONDITION, ACREAGE, YIELD AND VALUE OF CORN IN MISSOURI FOR TEN YEARS—Continued.

Corn.	Condition, per cent.						Part planted per cent.		Safe from frost, per cent., Oct 1.	Harvested for fodder, per cent October 1.....	Acres planted.	Average yield per acre, bu...	Total yield, bushels.	Total value.
	May.......	June	July.......	August	September .	October....	May 1.....	June 1.....						
Southeast	66	79	79	83	84	84	21	86	86	41	860,265	29	25,241,865	11,313,570
State	65	73	75	73	75.5	77	17	76	73	39	6,646,790	26.2	173,867,460	73,476,280
1905—Northeast	74	82	92	100	97	91	36	88	90.5	32.5	1,342,815	34.6	46,462,115	17,196,410
Northwest	75	82	91	97	91	85.5	27	90	91	14	2,145,145	36.6	79,561,185	27,430,736
Central	80	90	93	100	96	84	75	98	94	37	1,150,940	36	43,537,890	15,808,322
Southwest	87	86	96	101	97	85	77	97	96	25	1,566,420	29	47,544,160	15,999,624
Southeast	83	81	85	88	92	85	44	90	91	45	870,730	31.9	28,046,895	10,526,263
State	80	84	91	97	95	86	52	93	92	31	7,076,050	33.6	245,152,245	86,961,355
1906—Northeast	......	83.8	85.5	72	77	83.7	7.9	90.9	88.4	57.6	1,339,064	31.3	41,843,900	15,952,989
Northwest	......	77	79	80.3	84	87.1	9.7	93.1	87.7	48.5	2,133,099	35	74,525,705	27,445,159
Central	......	77.2	88.8	82.9	88.8	91.1	23.3	91.4	87.6	44.4	1,122,659	34.9	39,140,795	14,722,251
Southwest	......	80.4	91.6	92.3	95	96.7	63.5	90.2	91.2	28.5	1,536,394	32.2	49,527,190	16,119,575
Southeast	......	74.3	80.1	88.5	94.4	90.4	29.3	88	86.6	40.7	852,122	33	28,172,035	11,077,225
State	......	78.5	85	83.2	87.8	90.2	26.7	90.7	88.3	43.9	6,983,335	33.4	233,209,625	85,317,199
1907—Northeast	82	77	77	86	91	89	12	78	86	31	1,380,436	36.6	50,509,548	21,806,665
Northwest	85	80	83	90	96	97	15	86	89	19	2,183,074	39.5	86,314,480	36,549,099
Central	58	72	79	85	85	83	37	71	85	40	1,118,945	32.4	36,243,453	16,653,264
Southwest	67	71	76	78	67	67	74	76.5	88	34	1,547,670	23.8	36,887,072	17,313,345
Southeast	62	69	73	75	77	83	45	75	82	41	855,934	26.3	22,526,765	11,239,419
State	71	74	77	83	83	84	36	79	86	33	7,086,059	32.7	232,541,324	103,561,792
1908—Northeast	89	75	71	78	70	75	15	77	80	36	1,280,920	28	36,341,374	20,480,826
Northwest	95	75	71	71	72	73	16	77	83	20	1,946,443	29	56,451,067	32,154,790
Central	83	80	75	72	71	71	14	88	78	46	1,041,321	26	27,578,061	16,184,572
Southwest	81	77	73	70	72	72	16	86	81	32	1,422,300	22	32,153,720	17,261,403
Southeast	79	81	74	79	76.6	73	17	79	79	42	769,881	26	21,049,200	12,526,014
State	85	77	73	74	72	73	15	72	80	35	6,487,865	26	173,573,422	98,607,605
1909—Northeast	70.5	80.6	85.4	88.2	67.7	70.4	2.3	82.9	88.6	40.8	1,389,852	27.9	38,783,278	22,442,122
Northwest	68.5	83.6	79.3	77.3	63.1	67.3	18.7	88.9	85.4	34.2	2,165,798	28.5	61,794,925	36,585,579
Central	57.7	86.1	88.8	95.8	70.3	76.9	25.9	93.4	97.6	46.1	1,155,823	30.8	35,640,443	19,983,594
Southwest	92.4	87.6	91.2	88.3	59.7	59.8	47.7	97	97.4	34.3	1,631,422	23	37,593,785	21,634,061

Southeast	70.9	81.3	87.4	91.7	69.2	69.6	18.4	88.7	85.3	41.1	862,501	26.7	23,902,515	14,198,688
State	72	83.8	86.4	88.2	66	68.8	22.6	91.2	90.8	39.3	7,205,396	27.4	197,714,946	114,844,044
*Ten year average—Northeast	81.8	82.7	84.6	78.5	77	75.3	21.1	84.2	77.3	36.5	1,268,285	30	39,176,674	18,161,989
1900-1909 Northwest	83.5	82.1	82.5	78.2	79.3	75	20.4	85.9	80.8	27.1	2,094,505	31.9	67,796,270	29,788,948
Central	72.8	81	82.2	79.3	77.6	73.7	38.8	87.3	83.3	41.8	1,099,178	29.8	33,567,192	15,488,426
Southwest	81	79.7	82.4	77.9	74.5	69	58.4	88	88.3	32.2	1,573,539	24.4	38,939,381	16,807,249
Southeast	76.2	80.7	81	79.8	76.4	75	39.3	85.7	83.2	45.1	845,569	27	23,340,764	11,558,945
State	79	80.2	82.5	78.9	76.8	73.5	34.9	85.5	83.3	35.9	6,885,805	28.8	202,800,185	91,810,305

*It will be noted that the average is, in a few instances, for a shorter period than ten years.

TABLE SHOWING CONDITION, ACREAGE, YIELD AND VALUE OF WHEAT IN MISSOURI FOR EIGHT YEARS.

Wheat.	Condition.			Number of acres harvested.	Average yield per acre, bu.	Total yield, bushels.	Total value.
	April.......	May	June				
1902—Northeast	93	90	97	408,300	22.4	9,146,000	$5,414,432
Northwest	90	81	84	318,800	22.4	7,141,000	4,098,934
Central	91	95	96	513,900	22	11,306,000	6,150,464
Southwest	93	95	94	1,167,100	18	21,008,000	11,596,416
Southeast	85	87	89	758,800	16.4	12,444,000	7,229,516
State	92	90	92	3,166,900	19.3	61,045,000	34,490,000
1903—Northeast	92	90	81	308,930	10.8	3,340,155	2,304,705
Northwest	93	92	88	271,540	13.8	3,738,505	2,542,185
Central	86	85	61	498,605	8.4	4,176,820	2,882,020
Southwest	91	78	56	742,950	7.1	5,315,780	3,721,045
Southeast	92	86	59	690,955	8.1	5,582,840	4,019,655
State	91	86	69	2,512,980	8.8	22,154,100	15,469,610
1904—Northeast	82	81	81	305,640	12.1	3,714,825	3,491,935
Northwest	80	79	83	244,185	11.1	2,720,835	2,475,555
Central	81	81	85	486,245	9.9	4,836,385	4,788,020
Southwest	76	79	77	710,785	11.4	8,080,270	7,415,455
Southeast	84	83	79	697,905	12.7	8,890,640	8,466,115
State	81	81	81	2,444,760	11.5	28,245,955	26,637,080
1905—Northeast	93	91	86	302,865	16.7	5,056,025	4,094,637
Northwest	92	91	91	250,810	18.7	4,680,980	3,686,391
Central	95	92	83	475,575	15.3	7,284,970	5,758,898
Southwest	84	84	76	637,115	10.2	6,482,960	5,015,279
Southeast	92	88	75	673,045	10.1	5,831,045	5,435,758
State	91	89	82	2,339,410	13	30,335,980	23,990,965
1906—Northeast	86	86.9	80.1	287,585	18.8	5,413,145	3,707,973
Northwest	91	90.4	81.5	245,868	21.4	5,264,202	3,410,700
Central	79	82.5	69.7	441,572	14.7	6,509,155	4,235,326
Southwest	83	83.6	80.6	559,360	15.9	8,593,436	5,365,733

Southeast	85	85.1	76.7	652,494	13.8	9,019,231	6,178,447
State	85	85.7	77.7	2,266,799	15.8	31,799,169	22,898,179
1907—Northeast	94	88	90	297,126	16.4	5,009,230	4,222,508
Northwest	90	83	82	249,362	18.4	4,439,163	3,771,251
Central	96	88	81	450,174	13.1	6,155,885	5,506,945
Southwest	96	71	73	591,759	9.7	6,066,509	5,164,781
Southeast	95	81	74	635,657	10.4	6,859,227	5,998,916
State	94	82	80	2,224,078	15.6	28,830,014	24,664,401
1908—Northeast	90	91	87	242,857	15.6	3,789,509	3,605,740
Northwest	91	93	85	220,571	13.9	3,068,774	2,880,080
Central	91	94	85	416,862	10.8	4,526,008	4,205,940
Southwest	91	92	80	497,139	7.7	3,849,301	3,596,200
Southeast	91	93	84	550,299	9.9	5,451,227	5,224,700
State	91	93	84	1,927,728	10.7	20,684,819	19,512,660
1909—Northeast	76	81.3	80.7	242,454	19	4,615,644	5,053,523
Northwest	64	70.5	75	201,241	18	3,620,362	3,731,647
Central	67	72.7	72.4	410,985	15	6,134,517	6,462,415
Southwest	69	72.8	75.2	447,740	14	6,165,995	6,634,534
Southeast	76	74.7	78.5	497,585	13	6,966,361	7,726,295
State	70	74.4	76.4	1,800,005	15.3	27,502,879	29,608,414
Eight year average, 1902-1909—Northeast	88.2	87.4	85.3	299,473	16.4	5,010,566	3,986,931
Northwest	86.4	85	83.7	250,297	17.2	4,334,227	3,324,593
Central	85.7	86.2	79.5	461,739	13.6	6,403,717	4,998,753
Southwest	85.4	81.9	76.5	669,243	11.7	8,195,281	6,063,680
Southeast	87.5	84.7	76.9	644,592	11.8	7,630,571	6,284,925
State	86.8	85.1	80.3	2,335,332	13.7	31,699,739	24,658,913

Wheat.	Number of acres seeded for new crop.	Part sown Oct. 1, per cent.	Condition of soil for seeding.	Condition of growing crop Dec. 1.
1902—Northeast	404,200	69	....	100
Northwest	255,000	62	....	96
Central	462,600	45	....	93
Southwest	933,700	35	....	90
Southeast	766,400	33	....	101
State	2,821,900	49	....	96
1903—Northeast	324,515	62	....	92
Northwest	286,970	56	....	89
Central	533,090	55	....	85
Southwest	786,435	88	....	89
Southeast	769,230	20	....	79
State	2,700,240	56	....	87
1904—Northeast	303,460	60	....	75
Northwest	251,295	62	....	80
Central	478,875	53	....	76
Southwest	657,545	62	....	58
Southeast	692,105	29	....	76
State	2,383,280	53	....	73
1905—Northeast	297,920	50	....	95
Northwest	245,265	52	....	94
Central	451,355	25	....	87
Southwest	580,895	39	....	88
Southeast	633,975	35	....	88
State	2,239,410	38	....	90
1906—Northeast	300,787	67.7	80	82
Northwest	254,979	74.4	86.7	75
Central	465,721	67.4	88.5	86
Southwest	602,657	64.7	90.1	82
Southeast	657,813	31.2	84.8	85
State	2,281,957	61.1	86	82
1907—Northeast	263,817	49	76	79
Northwest	243,264	64	90	88
Central	448,046	54	73	88
Southwest	566,993	55	75	86
Southeast	588,549	39	77	85
State	2,110,669	52	78	85
1908—Northeast	249,053	56	83	83
Northwest	219,834	59	69	80
Central	427,067	47	80	80
Southwest	466,410	55	80	85
Southeast	515,775	15	68	68
State	1,878,139	46	76	79
1909—Northeast	288,832	60.9	91.4	93.5
Northwest	243,055	58.2	90.7	94
Central	432,091	64	84.1	92.8
Southwest	421,104	40.5	73.6	93.3
Southeast	538,805	26.7	85.6	94.2
State	1,923,887	50	85	93.5
*Eight year average, 1902-1909—Northeast	304,073	59.3	82.6	87.4
Northwest	249,958	60.9	84.1	87
Central	438,726	59.4	81.4	85.9
Southwest	626,967	54.9	79.7	83.9
Southeast	645,331	28.6	78.8	84.5
State	2,292,435	50.6	81.2	85.7

*Average on condition of soil for seeding is for four years.

TABLE SHOWING CONDITION, ACREAGE, YIELD AND VALUE OF OATS IN MISSOURI FOR SEVEN YEARS.

Oats.	Part sown April 1, Percent.	Condition.		Number of acres harvested.	Average yield per acre, bushels.	Total yield, bushels.	Total value.
		May 1.	June 1.				
1903—Northeast	7	77	78	190,406	23.4	4,455,490	$1,336,650
Northwest	6	87	86	166,337	26	4,324,760	1,297,425
Central	13	81	81	122,458	21.1	2,583,860	775,165
Southwest	25	84	80	193,500	23	4,450,495	1,379,650
Southeast	29	83	82	83,101	23.4	1,944,550	602,805
State	16	82	81	755,801	23.5	17,759,155	5,391,695
1904—Northeast	13	78	74	166,760	24.8	4,145,800	1,285,210
Northwest	4	80	73	142,800	21	2,996,910	988,990
Central	36	74	78	111,015	22.9	2,546,970	840,505
Southwest	86	78	81	201,320	19.5	3,928,220	1,178,470
Southeast	33	83	80	72,295	20.3	1,469,755	485,020
State	34	79	77	694,190	21.7	15,087 655	4,778,195
1905—Northeast	83	89	92	186,685	27.6	5,165,950	1,368,360
Northwest	76	92	92	154,615	30.7	4,761,350	1,347,197
Central	85	84	85	117,400	27	3,185,095	957,130
Southwest	81	84	83	198,540	26	5,254,495	1,456,809
Southeast	71	87	87	71,850	25	1,789,165	615,351
State	79	87	88	729,090	27.6	20,156,055	5,744,849
1906—Northeast	0	70.3	57.5	161,358	21.5	3,465,246	1,104,553
Northwest	0	74.9	54.2	137,983	23	3,344,690	1,042,301
Central	10.2	69.5	39	104,133	20	2,051,439	703,758
Southwest	8.7	80	40.7	184,568	21	3,956,131	1,173,860
Southeast	2.5	69.7	46	63,647	20	1,311,931	470,575
State	4.3	72.9	47.5	615 689	21.1	14,129,437	4,495,047
1907—Northeast	89	85	84	218,712	24.7	5,281,385	2,058,547
Northwest	85	82	82	145,634	26	3,418,877	1,365,184
Central	87	76	77	105,198	20	2,025,172	853,624
Southwest	92	61	60	187,320	17	3,114,101	1,269,411
Southeast	88	72	73	63,548	20.7	1,325,179	582,795
State	88	75	75	720,412	21.7	15,164,714	6,129,561

TABLE SHOWING CONDITION, AREAGE, YIELD AND VALUE OF OATS IN MISSOURI FOR SEVEN YEARS.—Continued.

Oats.	Part sown April 1, Percent.	Condition.		Number of acres harvested.	Average yield per acre, bushels.	Total yield, bushels.	Total value.
		May 1.	June 1.				
1908—Northeast	89	92	90	227,926	17	3,927,383	1,681,900
Northwest	92	90	86	141,172	16	2,270,529	1,069,510
Central	86	92	88	104,674	15	1,607,916	754,850
Southwest	90	90	87	181,945	16	3,035,306	1,306,680
Southeast	84	89	84	61,569	17	1,060,306	515,160
State	88	90	87	717,286	16	11,901,440	5,328,100
1909—Northeast	26.3	85.5	85.7	223,135	25.5	5,688,426	2,130,990
Northwest	22.6	84.5	88.5	138,047	28	3,902,174	1,539,796
Central	71.8	79.2	84.5	102,291	27.3	2,798,031	1,153,889
Southwest	82.4	81.6	79.1	177,097	27.9	4,953,100	1,993,928
Southeast	58.6	79.1	81.5	58,083	25.2	1,466,845	682,191
State	52.3	82	83.8	698,653	26.9	18,808,576	7,500,794
Seven year average, 1903-1909—Northeast	43.9	82.4	80.2	196,426	23.5	4,589,954	1,566,601
Northwest	40.8	84.3	80.2	146,655	24.4	3,574,184	1,235,772
Central	55.5	79.4	76.1	109,595	21.9	2,399,783	862,703
Southwest	66.4	79.8	72.9	189,184	21.5	4,098,835	1,394,115
Southeast	52.3	80.4	76.2	67,727	21.6	1,481,104	564,842
State	51.6	81.1	77	709.589	22.6	16,143,862	5,624,034

MISSOURI LIVE STOCK.

An abstract of the assessment of horses and mules as shown by the assessors' returns June 1, 1909. (Compiled from reports of State Auditor John P. Gordon.)

County.	Horses.			Mules.		
	No.	Valuation.	Average.	No.	Valuation.	Average.
Adair	9,409	$405,370	$43.08	1,335	$56,510	$42.33
Andrew	8,921	344,860	38.65	2,172	118,405	54.51
Atchison	8,268	271,920	32.87	2,884	107,270	37.20
Audrain	9,503	387,690	40.79	4,343	192,240	44.26
Barry	8,435	328,130	38.90	2,506	102,892	41.05
Barton	8,972	293,533	32.72	2,601	98,616	37.91
Bates	15,113	546,362	36.31	4,312	175,646	40.73
Benton	7,771	242,575	30.00	2,430	85,210	35.00
Bollinger	3,993	212,950	53.33	2,481	119,386	48.12
Boone	9,462	353,710	37.38	5,000	206,200	41.24
Buchanan	7,793	319,425	41.00	2,767	108,085	39.06
Butler	3,289	124,115	37.73	1,600	61,705	38.56
Caldwell	8,068	290,865	36.05	1,963	91,710	46.71
Callaway	9,482	296,315	31.35	5,187	220,720	42.55
Camden	5,032	261,250	51.91	1,651	103,150	62.47
Cape Girardeau	5,764	245,655	42.44	2,500	123,985	49.60
Carroll	11,659	386,793	33.17	4,760	180,610	37.94
Carter	1,050	54,202	51.62	670	37,555	56.05
Cass	13,688	476,612	34.82	3,770	150,688	39.97
Cedar	7,891	322,873	40.91	2,278	104,892	46.04
Chariton	11,329	451,272	39.83	3,337	174,205	52.20
Christian	7,500	278,193	37.09	1,938	80,046	41.30
Clark	8,283	280,435	33.86	922	34,405	37.31
Clay	7,182	268,110	37.33	1,877	81,515	43.43
Clinton	6,332	215,515	34.03	2,142	113,810	53.13
Cole	3,728	131,420	35.24	1,433	62,330	43.49
Cooper	6,789	319,595	47.07	4,680	273,425	58.42
Crawford	3,895	144,905	37.15	1,720	76,005	44.18
Dade	6,943	201,099	28.94	2,377	79,288	33.35
Dallas	5,721	192,421	33.59	1,857	61,343	33.03
Daviess	11,760	421,794	35.86	2,940	114,315	38.88
DeKalb	8,351	285,334	34.16	2,121	76,886	36.25
Dent	4,458	179,332	40.23	1,879	76,241	40.57
Douglas	6,314	286,806	45.44	1,225	59,970	48.79
Dunklin	4,515	198,925	44.05	4,433	227,110	51.23
Franklin	6,827	265,840	38.94	3,088	138,815	44.95
Gasconade	3,621	141,945	39.47	2,098	89,560	42.68
Gentry	11,061	407,449	36.84	1,905	66,697	35.01
Greene	14,246	530,452	37.23	3,762	169 116	44.95
Grundy	8,694	265,330	30.51	1,789	57,313	32.03
Harrison	16,795	511,195	30.43	2,504	72,685	29.02
Henry	11,515	391,120	33.96	4,022	155,720	38.71
Hickory	5,803	209,356	36.09	1,555	63,495	40.83
Holt	6,719	320,600	47.71	2,031	121,000	59.57

MISSOURI LIVE STOCK—Continued.

County.	Horses.			Mules.		
	No.	Valuation.	Average.	No.	Valuation.	Average.
Howard	6,209	$288,485	46.46	3,866	$225,440	58.26
Howell	6,558	244,369	37.26	2,081	88,380	42.47
Iron	1,884	68,327	36.26	810	34,680	42.81
Jackson	22,389	918,566	41.02	3,782	205,805	54.41
Jasper	15,347	580,762	37.77	2,290	108,157	42.78
Jefferson	6,202	177,893	28.68	2,548	88,473	34.72
Johnson	13,665	527,035	38.50	5,196	220,585	42.45
Knox	8,263	305,395	36.95	1,792	65,625	36.62
Laclede	6,761	276,050	40.86	1,910	86,710	45.40
Lafayette	11,453	458,110	39.99	4,865	243,270	50.00
Lawrence	9,405	324,228	34.47	2,784	107,708	38.68
Lewis	7,617	263,163	34.54	1,664	50,974	30.63
Lincoln	8,213	326,025	39.69	2,325	94,165	40.50
Linn	11,237	365,422	32.52	2,312	69,589	30.90
Livingston	10,428	347,150	33.30	2,209	73,564	33.30
McDonald	5,518	226,715	41.08	1,391	62,300	44.78
Macon	11,889	499,100	41.97	3,281	130,240	39.69
Madison	2,441	108,935	44.62	1,288	66,605	51.71
Maries	3,555	152,633	42.95	1,958	91,276	46.62
Marion	7,150	308,770	43.18	1,403	72,260	51.50
Mercer	9,448	378,485	40.05	1,268	49,375	39.09
Miller	6,284	221,430	35.23	2,268	87,350	38.52
Mississippi	2,617	91,035	34.78	4,477	205,995	46.01
Moniteau	6,040	264,575	43.80	2,677	141,710	52.93
Monroe	10,039	391,280	38.97	4,430	183,540	41.43
Montgomery	5,812	211,930	36.46	2,775	125,750	45.31
Morgan	6,018	196,400	32.63	2,638	105,700	40.06
New Madrid	2,682	88,545	3.013	4,460	179,310	40.20
Newton	9,842	259,770	26.39	1,740	46,045	26.46
Nodaway	16.747	541,800	32.36	2,737	91,820	33.55
Oregon	4,151	130,940	31.30	1,911	64,380	33.77
Osage	3,829	150,560	39.32	2,602	135,415	52.04
Ozark	4,910	215,396	43.86	1,516	78,832	52.00
Pemiscot	2,408	94,929	39.42	3,664	165,975	45.29
Perry	4,838	144,964	29.96	2,680	91,771	34.24
Pettis	11,624	438,660	37.73	4,593	258,570	56.29
Phelps	4,499	162,465	36.11	1,526	68.452	44.13
Pike	7,551	283,590	37.55	2,914	120,930	41.49
Platte	6,191	232,340	37.52	2,725	135,005	49.54
Polk	12,087	430,040	35.50	3,794	157,367	41.40
Pulaski	4,460	169,385	37.96	1,052	48,950	46.53
Putman	10,380	328,771	31.67	1,459	40,846	27.99
Ralls	5,291	262,980	49.50	1,570	77,230	42.00
Randolph	7,729	314,230	40.65	2,257	96,070	42.56
Ray	9,931	337,250	33.95	4,134	174,280	42.13
Reynolds	2,704	123,828	45.80	1,467	90,145	61.44
Ripley	3,268	208,920	63.94	1,290	85,975	66.65
St. Charles	6,676	315,495	47.25	2,868	148,390	51.73

MISSOURI LIVE STOCK—Continued.

County.	Horses.			Mules.		
	No.	Valuation.	Average.	No.	Valuation.	Average.
St. Clair	9,525	$327,375	34.35	1,997	$92,747	46.44
St. Francois	3,776	145,448	38.25	1,375	63,770	46.37
Ste. Geneveive	3,035	115,015	37.89	1,169	62,235	53.23
St. Louis	10,409	440,360	42.30	3,411	179,720	52.68
Saline	10,477	406,355	38.80	6,613	354,845	53.66
Schuyler	6,403	230,840	36.05	865	29,195	33.75
Scotland	8,827	323,935	36.69	1,343	48,555	36.92
Scott	3,978	171,938	43.22	5,077	254,655	50.16
Shannon	3,486	154,724	44.09	1,507	79,292	52.60
Shelby	9,184	331,505	36.10	3,356	117,160	34.91
Stoddard	7,336	291,490	39.73	4,246	196,786	46.34
Stone	4,391	152,833	34.80	1,245	53,523	43.00
Sullivan	12,250	369,591	30.17	2,196	64,057	29.17
Taney	3,969	174,317	43.91	1,170	57,816	49.41
Texas	8,411	291,940	34.71	2,551	115,572	45.30
Vernon	13,965	417,863	29.90	3,622	129,681	35.66
Warren	2,669	123,780	46.37	1,240	65,965	53.19
Washington	3,599	137,645	38.24	1,735	78,675	45.34
Wayne	3,626	162,650	44.86	2,145	117,969	55.00
Webster	6,994	275,525	37.10	2,288	97,730	42.71
Worth	7,099	278,350	39.21	624	25,730	41.23
Wright	7,578	270,809	35.74	2,133	81,446	38.18
St. Louis City	11,658	553,730	47.50	1,177	57,220	48.61

An abstract of the assessments of asses and jennets and neat cattle as shown by the assessors' returns June 1, 1909. (Compiled from reports of State Auditor John P. Gordon.)

County.	Asses and jennets.			Neat cattle.		
	No.	Valuation.	Average.	No.	Valuation.	Average.
Adair	42	$2,725	64.88	24,209	$305,800	12.63
Andrew	123	7,885	64.10	24,905	392,840	15.77
Atchison	37	3,000	81.08	28,889	494,875	17.13
Audrain	175	9,190	52.51	18,384	268,890	14.62
Barry	141	6,579	46.66	17,965	180 737	10.06
Barton	94	4,980	52.98	18,099	176,196	9.74
Bates	216	11,496	53.22	30,235	333,789	11.04
Benton	111	4,880	44.00	21,233	269,741	12.50
Bollinger	86	4,695	54.60	12,430	122,564	9.86
Boone	243	10,885	44.79	17,361	253,905	14.62
Buchanan	194	9,045	46.63	15,214	243,019	15.10
Butler	38	1,230	32.37	12,402	92,380	7.45
Caldwell	68	4,230	62.20	21,435	286,125	13.34
Callaway	355	23,350	65.77	16,008	224,575	14.02
Camden	55	4,770	86.72	16,508	255,495	15.41
Cape Girardeau	102	8,215	80.54	10,521	106,374	10.11

MISSOURI LIVE STOCK—Continued.

County.	Asses and jennets.			Neat cattle.		
	No.	Valuation.	Average.	No.	Valuation.	Average.
Carroll	128	$5,965	46.61	20,907	$284,313	13.59
Carter	13	510	38.23	5,773	60,962	10.56
Cass	164	11,895	72.53	26,907	308,500	11.46
Cedar	88	8,630	98.06	17,627	219,735	12.46
Chariton	96	10,540	109.79	21,455	320,725	14.94
Christian	130	5,453	41.95	16,693	182,124	10.91
Clark	18	1,470	81.66	21,977	199,955	9.09
Clay	88	9,640	109.54	17,609	248,055	14.08
Clinton	37	3,355	90.64	26,342	434,430	16.49
Cole	38	1,805	47.50	9,874	99,095	10.04
Cooper	153	10,750	70.26	15,725	245,201	15.59
Crawford	42	2,555	63.21	13,831	142,960	10.33
Dade	146	4,070	27.87	16,555	152,630	9.22
Dallas	84	3,983	47.41	14,667	130,608	9.18
Daviess	112	12,260	109.46	28,112	357,789	12.72
DeKalb	65	3,454	62.80	25,507	312,980	12.27
Dent	105	4,395	41.85	13,789	152,898	11.01
Douglass	69	3,450	50.00	16,356	195,024	11.92
Dunklin	27	1,985	73.51	13,643	106,607	7.81
Franklin	55	3,270	59.45	13,161	194,930	14.05
Gasconade	35	2,290	65.42	9,516	95,842	10.71
Gentry	114	6,965	61.09	29,092	414,423	14.23
Greene	117	7,262	62.06	24,642	290,016	11.76
Grundy	120	5,860	48.83	22,719	283,506	12.47
Harrison	93	9,050	97.41	44,248	590,849	13.33
Henry	146	6,979	47.80	25,891	273,705	10.57
Hickory	97	6,541	69.50	14,803	142,380	9.63
Holt	38	3,120	82.10	15,050	215,450	14.31
Howard	171	15,280	89.35	13,845	236,750	17.10
Howell	109	6,365	58.39	16,799	165,119	9.83
Iron	24	960	40.00	5,931	58,241	9.81
Jackson	....	....	....	25,640	380,888	14.85
Jasper	74	4,760	64.32	19,917	235,782	11.80
Jefferson	50	2,490	49.80	13,599	129,741	9.54
Johnson	265	14,350	54.77	31,718	437,625	13.80
Knox	63	3,280	52.06	19,654	270,330	13.75
Laclede	120	5,345	44.54	15,944	227,710	14.28
Lafayette	115	8,030	70.00	24,217	363,255	15.00
Lawrence	103	5,560	53.98	16,923	198,679	11.74
Lewis	92	4,845	52,66	17,990	247,365	13.75
Lincoln	68	4,560	67.06	14,044	159,860	11.38
Linn	85	4,535	53.35	36,085	447,863	12.41
Livingston	83	4,515	54.36	21,288	236,434	11.10
McDonald	88	3,635	41.30	10,785	116,768	10.82
Macon	129	9,795	75.93	30,010	422,660	14.08
Madison	22	1,755	79.32	8,027	82,998	10.33
Maries	48	2,470	50.15	11,088	121,968	11.00
Marion	54	6,925	128.24	11,458	175,025	15.27

MISSOURI LIVE STOCK—Continued.

County.	Asses and jennets.			Neat cattle.		
	No.	Valuation.	Average.	No.	Valuation.	Average.
Mercer	78	$3,555	45.57	25,436	$430,620	17.38
Miller	53	3,985	75.18	15,922	166,260	10.44
Mississippi	34	1,060	31.17	7,134	61,074	8.56
Moniteau	112	9,265	82.72	12,046	154,865	12.85
Monroe	226	16,380	72.47	19,530	300,880	15.40
Montgomery	73	5,670	77.67	12,661	158,275	12.50
Morgan	111	4,340	39.09	13,087	133,305	10.18
New Madrid	18	725	40.27	10,181	52,325	5.13
Newton	106	4,020	37.92	14,500	134,196	9.25
Nodaway	73	4,600	63.01	53,877	544,771	10.11
Oregon	32	2,035	63.57	15,448	128,410	8.31
Osage	52	2,635	50.67	11,575	116,485	10.06
Ozark	69	4,835	70.22	20,522	208,454	10.15
Pemiscot	25	965	38.60	9,776	53,952	5.52
Perry	42	2,028	48.28	8,308	69,319	8.34
Pettis	139	6,440	46.33	26,364	392,115	14.87
Phelps	55	2,470	44.90	13,718	155,467	11.33
Pike	199	9,480	47.63	12,340	160,450	13.
Platte	110	7,585	68.95	10,718	139,765	13.04
Polk	229	14,790	64.50	22,812	252,918	11.00
Pulaski	31	1,920	61.93	12,550	130,670	10.41
Putnam	58	2,490	42.93	30,297	382,283	12.61
Ralls	162	8,750	54.00	10,270	154,832	15.00
Randolph	171	12,025	70.32	14,401	233,695	16.22
Ray	162	12,230	75.50	17,675	296,620	16.78
Reynolds	24	1,875	78.12	14,185	144,648	10.19
Ripley	49	2,410	49.20	12,161	128,993	10.60
St. Charles	61	3,055	50.08	11,714	167,065	14.26
St. Clair	88	5,525	61.65	21,030	258,772	12.30
St. Francois	34	1,330	39.11	8,441	100,801	11.94
Ste. Genevieve	41	3,300	80.42	7,651	83,242	10.87
St. Louis	....	....	....	9,621	162,420	16.88
Saline	183	10,645	58.20	32,983	530,665	16.08
Schuyler	44	1,700	38.64	14,309	160,595	11.22
Scotland	84	3,200	38.09	20,714	238,205	11.50
Scott	40	2,630	65.75	8,956	101,572	11.34
Shannon	97	2,985	30.77	14,636	165,640	11.31
Shelby	163	10,995	67.45	17,713	263.130	14.85
Stoddard	60	3,285	54.75	16,712	133,123	7.96
Stone	87	3,970	45.63	11,608	112,397	9.68
Sullivan	126	5,775	45.80	36,514	505,379	13.84
Taney	87	3,953	45.43	15,361	199,564	12.97
Texas	196	9,783	49.91	25,454	257,568	10.12
Vernon	151	7,950	52.64	32,171	322,588	10.02
Warren	28	2,400	85.71	6,727	87,505	13.01
Washington	50	3,115	62.30	12,922	127,350	9.85
Wayne	29	1,630	56.20	15,612	140,410	8.99
Webster	147	8,000	42.71	17,438	188,880	10.82
Worth	61	4,890	80.16	18,866	344,311	18.45
Wright	95	4,807	50.60	20,086	212,840	10.59
St. Louis City	....	....	....	3,093	59,530	19.25

MISSOURI LIVE STOCK—Continued.

An abstract of the assessment of sheep and hogs as shown by the assessors' returns June 1, 1909. (Compiled from reports of State Auditor John P. Gordon.)

County.	Sheep.			Hogs.		
	No.	Valuation.	Average.	No.	Valuation.	Average.
Adair	11,108	$22,455	2.02	9,623	$34,540	3.58
Andrew	6,407	18,430	2.87	27,697	134,395	4.85
Atchison	1,263	2,520	2.00	31,203	99,210	3.18
Audrain	20,682	34,945	1.68	23,954	100,570	4.17
Barry	7,581	12,108	1.59	15,919	21,430	1.34
Barton	3,312	4,228	1.28	13,701	32,299	2.36
Bates	11,075	22,250	2.00	33,695	95,368	2.85
Benton	7,552	13,345	1.76	16,062	33,897	2.10
Bollinger	10,702	16,949	1.58	27,659	39,959	1.44
Boone	12,798	29,700	2.33	23,338	63,655	2.72
Buchanan	3,824	7,710	2.00	19,466	57,451	2.95
Butler	1,082	1,170	1.08	19,258	21,485	1.11
Caldwell	14,457	31,321	2.16	25,843	67,745	2.62
Callaway	22,081	40,670	1.84	27,490	62,905	2.28
Camden	16,389	32,755	2.02	16,746	39,965	2.32
Cape Girardeau	7,212	12,362	1.70	19,908	54,184	2.72
Carroll	9,248	14,043	1.51	30,792	69,699	2.23
Carter	1,223	1,535	1.25	11,207	13,044	1.16
Cass	10,530	18,576	1.76	37,471	91,380	2.43
Cedar	7,662	13,849	1.82	21,634	46,037	2.12
Chariton	18,126	44,997	2.48	15,601	58,816	3.77
Christian	11,774	19,214	1.63	25,539	41,165	1.61
Clark	8,844	18,483	2.09	7,111	34,880	4.90
Clay	10,789	25,045	2.32	23,519	83,960	3.56
Clinton	3,996	6,565	1.64	22,051	58,865	2.66
Cole	1,986	2,395	1.21	9,697	14,420	1.48
Cooper	8,501	17,004	2.00	30,904	95,210	3.08
Crawford	5,511	13,330	2.41	10,338	20,040	1.93
Dade	10,432	15,134	1.45	21,010	43,071	2.05
Dallas	7,481	12,471	1.67	13,714	20,376	1.48
Daviess	21,148	41,276	1.95	34,558	83,831	2.39
DeKalb	8,962	18,855	2.10	26,109	80,864	3.09
Dent	9,191	9,752	1.06	14,483	15,671	1.08
Douglas	16,172	49,667	3.07	20,237	36,486	1.80
Dunklin	282	280	99	27,812	36.360	1.30
Franklin	4,305	10,410	2.41	17,731	53,515	3.02
Gasconade	3,463	6,414	1.85	11,505	28,324	2.46
Gentry	13,676	22,831	1.66	27,301	72,870	2.67
Greene	11,671	19,523	1.67	26,137	56,901	2.17
Grundy	18,809	35,438	1.88	18,237	43,858	2.40
Harrison	22,683	66,113	2.91	36,543	128,491	3.24
Henry	6,096	9,807	1.61	28,651	72,139	2.51
Hickory	7,898	13,902	1.76	11,630	21,988	1.89
Holt	1,527	3,920	2.56	20,335	95,310	4.68
Howard	9,504	21,980	2.31	21,563	72,585	3.36
Howell	7,570	8,389	1.11	26,071	29,083	1.11
Iron	1,598	1,771	1.10	6,931	8,498	1.22
Jackson	10,949	20,585	1.88	30,829	106,974	3.43

MISSOURI LIVE STOCK—Continued.

County.	Sheep.			Hogs.		
	No.	Valuation.	Average.	No.	Valuation.	Average.
Jasper	3,797	$8,274	2.18	14,932	$38,958	2.60
Jefferson	2,114	4,058	1.92	13,444	24,846	1.85
Johnson	19,720	34,780	1.76	37,862	94,840	2.50
Knox	12,715	18,699	1.47	16,678	43,381	2.60
Laclede	13,451	26,872	2.00	15,365	36,573	2.38
Lafayette	9,092	18,185	2.00	27,338	95,685	3.50
Lawrence	6,301	8,755	1.38	18,981	40,463	2.13
Lewis	11,329	32,056	2.82	12,007	41,364	3.44
Lincoln	5,907	16,695	2.82	30,110	81,225	2.69
Linn	17,776	26,042	1.47	19,867	48,451	2.48
Livingston	12,360	21,510	1.74	23,601	64,984	2.75
McDonald	7,257	10,714	1.33	18,115	33,824	1.86
Macon	14,462	25,660	1.77	11,294	43,160	3.82
Madison	3,311	5,099	1.54	10,481	14,660	1.39
Maries	8,325	13,417	1.60	17,532	17,532	1.00
Marion	9,532	18,745	1.96	13,509	51,595	3.81
Mercer	8,457	20,395	2.41	16,513	57,320	3.47
Miller	7,955	12,025	1.51	16,961	27,880	1.64
Mississippi	163	195	1.19	16,361	31,931	1.95
Moniteau	3‘912	8,660	2.47	15,354	40,700	2.65
Monroe	31,849	57,140	1,79	22,548	71,480	3.17
Montgomery	8,286	17,180	2.07	20,525	71,970	3.50
Morgan	7,488	14,185	1.89	12,946	22,760	1.75
New Madrid	429	429	1.00	17,496	17,535	1.00
Newton	1,544	2,005	1.29	12,026	20,885	1.73
Nodaway	6,935	7,152	1.03	45,366	122,126	2.69
Oregon	5,308	5 ,308	1.00	26,050	26,050	1.00
Osage	4,153	6,395	1.54	14,811	29,145	1.97
Ozark	5,775	8,635	1.49	17,936	23,475	1.30
Pemiscot	147	156	1.06	17,266	19,533	1.12
Perry	8,697	10,621	1.22	23,003	29,478	1.28
Pettis	9,461	20,300	2.14	28,201	84,675	3.00
Phelps	6,914	7,288	1.05	11,254	18,685	1.65
Pike	9,190	18,770	2.04	16,643	47,660	2.86
Platte	7,886	26,385	2.07	19,128	53,275	2.78
Polk	18,268	35,521	1.94	23,277	51,220	2.20
Pulaski	13,110	14,450	1.10	11,275	12,694	1.12
Putnam	13,950	17,225	1.23	11,509	28,920	2.51
Ralls	11,850	28,465	2.40	9,022	45,600	5.06
Randolph	13,003	28,322	2.17	9,178	31,780	3.46
Ray	7,293	14,485	1.98	30,113	93,175	3.08
Reynolds	3,478	4,041	1.16	19,974	22,432	1.12
Ripley	2,928	4,396	1.50	21,801	27,893	1.28
St. Charles	3,803	8,248	2.17	20,099	56,955	2.83
St. Clair	8,004	8,384	1.05	20,845	53,927	2.59
St. Francois	2,212	4,614	2.08	6,925	16,431	2.37
Ste. Genevieve	4,204	6,829	1.62	12,241	22,908	1.87
St. Louis	808	2,070	2.56	11,654	38,860	2.33

MISSOURI LIVE STOCK—Continued.

County.	Sheep.			Hogs.		
	No.	Valuation.	Average.	No.	Valuation.	Average.
Saline	7,026	$12,385	1.76	33,671	$108,755	3.23
Schuyler	41,198	61,625	1.49	7,202	16,580	2.30
Scotland	14,013	27,635	1.97	12.244	36,975	3.01
Scott	1,478	2,451	1.66	23,643	42,837	1.81
Shannon	2,961	3,229	1.09	19,590	21,304	1.08
Shelby	16,016	28,950	1.80	16,836	59,215	3.51
Stoddard	3,343	3,354	1.00	37,579	37,797	1.00
Stone	7,659	11,535	1.50	16,372	20,484	1.25
Sullivan	19,879	33,261	1.67	17,336	43,383	2.50
Taney	5,698	10,522	1.84	13,864	17,556	1.26
Texas	16,500	24,524	1.49	25,148	36,835	1.46
Vernon	4,170	5,775	1.40	25,850	62,865	2.43
Warren	2,080	4,195	2.01	9,843	25,620	2.50
Washington	3,701	4,204	1.13	10,974	13,455	1.22
Wayne	3,018	5,220	1.72	25,454	42,351	1.66
Webster	11,270	17,915	1.58	14,207	23,345	1.78
Worth	7,198	17,848	2.48	12,355	45,933	3.72
Wright	20,096	32,901	1.62	19,378	25,114	1.30
St. Louis City						

ANNUAL REPORT OF DR. D. F. LUCKEY, STATE VETERINARIAN, FOR THE YEAR BEGINNING DECEMBER 17, 1908, AND ENDING DECEMBER 17, 1909.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1909			
Mitchell Peyton	Patterson, Mo	Return visit	May 1	Horses		Advised to continue to watch horses for signs of glanders.
Glen Hardeman and others.	Gray's Summit, Mo	Return visit	June 2	Cattle	Rabies	
W. G. Wilson	Centerville, Mo	Return visit	June 3	Horses		Released gelding from quarantine.
L. Helvey	Centerville, Mo	Return visit	June 3	Horses		Released mare from quarantine
Geo. Johnson	Clifton, Mo	Petition	June 9	30 cattle	Plant poisoning	Advised removal of cattle to another pasture
Matt McKinney	Cairo, Mo	Report of U. S. Inspector	Sept. 24	200 sheep	Lip and leg disease	Isolated and treated
C. G. Reynolds	Cairo, Mo	Report of U. S. Inspector	Sept. 24	150 sheep	Lip and leg disease	Isolated and treated

NOTE: The above table shows only a small part of the work of the State Veterinarian during the year. The greater part of his time was taken up with office work and Farmers' Institutes. He took personal charge of the tick eradication work in South Missouri, and was in the field for full 3 months.

ANNUAL REPORT OF DR. HORACE BRADLEY, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 17, 1908, to DEC. 17, 1909.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of
			1909			
J. N. Rich	Racket, Mo	Brought by owner.	Jan. 20	1 gray mare	Suspected chronic farcy	Bella donna and Pot. Iod
Jos. Blocker	Adrian, Mo	Secretary Ellis	Mar. 5-6	1 horse	Purpura hemorrhagic	
J. N. Rich	Racket, Mo	Return visit	June 28	1 gray mare		Released quarantine
Amos Schindler	Garden, City, Mo	Secretary Ellis	July 3	2 horses	Chronic glanders	Quarantined and notified county court
John Fetterling	Warrensburg, Mo	Secretary Ellis	July 7	1 cow	Rabies (dumb form)	
Jas. Seifris	Panama, Mo	Secretary Ellis	July 18	1 horse	"Barn fever"	
H. G. Ellis	Windsor, Mo	Secretary Ellis	Dec. 9	1 horse	Lymphangitis	

ANNUAL REPORT OF DR. E. BRAINERD, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 17, 1908, TO DEC. 17, 1909.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
H. P. Flick	Arbela, Mo		1909 Feb. 18	40 sheep	Scabies	Quarantined
C. G. Fritz	Azen, Mo	Secretary Ellis	Aug. 9	20 sheep	Foot rot	Trim the feet as prescribed

ANNUAL REPORT OF DR. HENRY F. BOETTNER, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 17, 1908, TO DEC. 17, 1909.

Owner	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
A. G. Landgrof	Pocahontas Cape, Mo	By petition	1909 July 28	30 cattle	Opthalmia	Medicinal treatment
David Shearer	Fredericktown, Mo	By petition	Aug 2	1 mule		Died before call

ANNUAL REPORT OF DR. L. D. BROWN, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 17, 1908, TO DEC. 17, 1909.

Owner.	Postoffice	How called.	Date.	Kind of stock.	Disease.	How disposed of.
S. M. Adams	Hamilton, Mo	Report of neighbor.	1908 Dec. 17	180 sheep	Scabies	Lime and sulphur dip
J. W. Brown	Jacksonville, Mo	Petition	1909 April 15	Herd of cattle	Mal-nutrition	Change of feed
E. E. Buxton, Allen, Erisman, et al	Purdy, Mo	Petition	May 21	1 stallion, 16 mares	Septic infection and septic vulvitis	Antiseptic treatment
Walter Burket	Butterfield, Mo	Petition	May 21	1 mare	Injured in breeding	Antiseptic treatment
C. R. Edson, Claire, Newby B. F. Johnson, et al	Cassville, Mo	Dr. Luckey	Aug. 2	Cattle	Texas fever	Quarantined
C. Rysted	Greenfield, Mo	Dr. Luckey	Sept. 7	1 horse	Frontal abscess	Good care advised

Adam Rosch	Lockwood, Mo	Dr. Luckey	Sept. 7	Horses	Influenza	Good care, proper hygiene and tonic treatment
R. D. Snow	Shell Knob, Mo	Petition	Sept. 27	1 horse	Nasal gleet	Recommend extracting teeth
Charles Walter	Rockport, Mo	Secretary Ellis	Nov. 27	4 horses	Glanders	Affected ones destroyed. Exposed ones isolated
J. F. Rohrback	California, Mo	Secretary Ellis	Dec. 2	5 cows	Tuberculosis	Cleaning and disinfecting barns. Disposing of affected animals
McLean & Elliott	Warrensburg, Mo	Secretary Ellis	Dec. 9	Cattle, 1 cow	Tuberculosis	Separated from herd and quarantined

NOTE: Dr. Brown, is employed regularly in testing herds of cattle for tuberculosis, and on tick eradication work in South Missouri. Work shown in the above table was only incidental.

ANNUAL REPORT OF DR. A. C. DONOHUE, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 17, 1908, TO DEC. 17, 1909.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
J. G. Edwards	Boonville, Mo	By letter	1909 April 16	1 cow	Rabies	Advised killing and burning

ANNUAL REPORT OF DR. R. B. LOVE, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 17, 1908, TO DEC. 17, 1909.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1909			
Crisp & Cantrell	Manes, Mo	Secretary Ellis	June 6	3 cattle		General line of treatment
Frisco R. R	St. James, Mo	Wired by Luckey	Aug. 25	cattle	Southern cattle	Quarantined

ANNUAL REPORT OF DR. J. H. McELROY, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 17, 1908, TO DEC. 17, 1909.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease...	How disposed of.
George Conn	Grant City, Mo	By owner	1909 Dec. 23	42 horses and 2 mules	Mange	Coal tar dips, followed by Beaumont oil
J. E. Clary	Sheridan, Mo	Secretary Ellis	1909 Jan. 7	140 sheep	Ptomaine poisoning	Entire change of diet
Julius Quivey & Sam Ferguson	Grant City, Mo	Quivey & Ferguson	Jan. 26	2 horses	Mange	Coal tar dips, followed by Beaumont oil
E. W. Cooper	Hatfield, Mo	Secretary Ellis	Feb. 1	1 horse	Chronic fistula	Advised trephining
Fred Rowen	Grant City, Mo	By owner	April 26	5 horses	Mange	Coal tar dips, succeeded by Beaumont oil

ANNUAL REPORT OF DR. F. W. O'BRIEN, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 17, 1908, TO DEC. 17, 1909.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
N. M. Young	Paris, Mo	Secretary Ellis	1909 April 1	Sheep	Scabies	Advised that dipping be used until a cure was effected

ANNUAL REPORT OF DR. R. P. POAGE, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 17, 1908, TO DEC. 17, 1909.

Owner.	Postoffice	How called.	Date.	Kind of stock.	Disease.	How disposed of
	Brookfield, Mo	Secretary Ellis	1909 May 29	1 horse	Glanders	Man reporting case was out of town, so could not locate affected animal
John Buswell	Brookfield, Mo	Secretary Ellis	June 2	1 horse	Glanders	Appraised and destroyed

ANNUAL REPORT OF DR. SAMUEL SHELDON, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 17, 1908, TO DEC. 17, 1909.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
Geo. Baston	Galt, Mo	Secretary Ellis	1908 Dec. 20	10 horses	Mexican mange	Quarantined and treated
R. A. Criukshanks	Browning, Mo	Private practice	1909 May 12	2 horses	Glanders	Notified county court and to be destroyed.
Mrs. Jas. Dusenberry	Breckenridge, Mo	Secretary Ellis	Sept. 15	1 horse	No disease	

ANNUAL REPORT OF DR. J. HARVEY SLATER, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 17, 1908, TO DEC. 17, 1909.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
Grotjahn and Atterberry	Mendon, Mo	Secretary Ellis	1909 May 24	475 sheep	Foot rot	Continuance of treatment advised by Dr. Luckey
O. D. Felt, Wm. Gilby	Lawson, Mo	Secretary Ellis	Aug 25	1 sorrel gelding	Chronic glanders	Quarantined
W. A. Rowland	Lawson, Mo	Secretary Ellis	Sept. 20	1 sorrel mare	Glanders	Quarantined
Wm. Gilby	Lawson, Mo	Return visit	Oct 26	1 sorrel gelding	Chronic glanders	Quarantine retained

ANNUAL REPORT OF DR. STANLEY SMITH, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 17, 1908, TO DEC. 17, 1909.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
Curtis Cook		Dr. Luckey	1909 April 8	Horses	Suspected glanders	
Harry L. Tucker	Vandalia, Mo	Secretary Ellis	June 16	130 sheep	Pneumonia	

ANNUAL REPORT OF DR. S. G. STARR, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 17, 1908, TO DEC. 17, 1909.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1909			
Henry Westerhold	Odessa, Mo	Dr. Luckey	June 24	7 cattle	No disease	Tested herd

ANNUAL REPORT OF DR. C. E. STEEL, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 17, 1908, TO DEC. 17, 1909.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1909			
Oliver Beauchamp	Craig, Mo	Secretary Ellis	Jan. 2	Cattle	Probably tuberculosis	Advised testing
Frank Wright	Craig, Mo	Secretary Ellis	Jan. 5	1 2-yr. old filley	Suspected glanders	Isolation
A. O. Swope	Mound City, Mo	By owner	Apr. 12	5 horses, 4 cows	"Lone Star" ticks	
H Harnes	St. Joseph, Mo	By owner	April 29	1 aged mare	Chronic nasal catarrh	Mallein test given

ANNUAL REPORT OF DR. H. V. GOODE, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 17, 1908, TO DEC. 17, 1909.

Owner.	Postoffice	How called.	Date.	Kind of stock.	Disease.	How disposed of
			1909			
H. N. Bunch	Down, Mo	Secretary Ellis	Aug. 28	35 horses	Scabies	

ANNUAL REPORT OF DR. H. C. TUCK, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 17, 1908, TO DEC. 17, 1909.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1908			
W. H. Lewis	Mountain View, Mo	Secretary Ellis	Dec. 20	1 mare	Strangles	
Mitchell Peyton	Patterson, Mo	Secretary Ellis	Dec. 20	2 mares	Suspected glanders	Isolation for further developments.
W. G. Wilson	Centerville, Mo	Secretary Ellis	Dec. 20	1 mare	Suspected glanders	Isolation for further observation
L. Helvey	Centerville, Mo	Secretary Ellis	Dec. 20	1 mare	Chronic glanders	Destruction as prescribed by law

Geo. Brann	Farmington, Mo	Dr. Luckey	1909 Feb. 15	1 mare	Caries	Advised destruction
W. E. Jarman	Southwest City, Mo		Sept. 22	1 gelding	Chronic glanders	Destruction as prescribed by law
S. A. Robinson	Southwest City, Mo	By owner	Sept. 23	1 gelding	Chronic glanders	Destruction as prescribed by law
Mrs. H. L. Miller	Victoria, Mo	Secretary Ellis	Dec. 7	1 cow	Tuberculosis	Isolation
Clean Milk Dairy Co	Jarvis, Mo	Secretary Ellis	Dec. 15	2 cows	Tuberculosis	Destruction according to law

NOTE: Dr. Tuck is imployed regularly in testing herds of cattle for tuberculoses and on tick eradication work in South Missouri. Work shown in the above table was only incidental.

ANNUAL REPORT OF DR. R. C. MOORE, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 17, 1908, TO DEC. 31, 1909.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
J. A. Maynard	Kansas City, Mo	By owner	1908 Dec. 25	1 Bay mare	Chronic glanders	Quarantined and reported to county court
John Cole	Independence, Mo	Dr. Peck	1909 Jan. 1	1 horse	Nasal catarrh	
John Ritter	Kansas City, Mo	Dr. Gatchell	Jan. 21	1 horse	Chronic glanders	Quarantined and reported to county court
J. T. Ricketts	Kansas City, Mo	Dr. Ricketts	Jan. 23	2 horses, 1 mule	Chronic glanders	Quarantined and reported to county court
John Coleman	Kansas City, Mo		Jan. 25	1 horse	Chronic glanders	Quarantined and reported to county court
Chas. Bruns	Kansas City, Mo	Dr. Hickman	Feb. 2	1 horse	Chronic glanders	Quarantined and reported to county court
Chas. Bruns	Kansas City, Mo	Return visit	Feb. 10	Stable		Found clean
F. J. Rode	Kansas City, Mo	Owner	Feb. 10	1 horse	Chronic glanders	Quarantined and reported to county court
Ben Lusk	Kansas City, Mo	Dr. Gatchell	Feb. 11	1 mule	Chronic glanders	Quarantined and reported to county court
Dick Doyle	Kansas City, Mo	Henry Hunt	Feb. 13	1 horse		Not found
W. A. Brannock	Kansas City, Mo	Dr. Byrd	Feb. 19	1 horse	Glanders	Quarantined and reported to county court
Dick Duff	Kansas City, Mo	Dr. Gatchell	Feb. 20	1 horse		
Dr. Gatchell	Kansas City, Mo	Owner	Feb. 20	1 horse	Empyenia of sinus	
C. W. Brady	Independance, Mo	Dr. Peck	Feb. 23	1 horse	Chronic glanders	Quarantined and reported to county court

ANNUAL REPORT OF DR. R. C. MOORE, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 17, 1908, TO DEC. 31, 1909—Continued.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
W. A. Cunningham	Independence, Mo.	Dr. Peck	Feb. 24	1 horse	Chronic glanders	Quarantined and reported to county court
Ben Lusk	Kansas City, Mo	Dr. Gatchell	Feb. 25	1 mule	Chronic glanders	Quarantined and reported to county court
Lansing and Harris	Kansas City, Mo		Feb. 26	Several horses	Exposed to glanders	Quarantined
Ben Lusk	Kansas City, Mo		Feb. 26	1 horse	Chronic glanders	Quarantined and reported to county court
J. T. Ricketts	Randolph, Mo	Owner	Feb. 28	Several horses	Suspected glanders	Quarantined
J. J. Burch	Kansas City, Mo		March 4	1 horse	Chronic glanders	Quarantined and reported to county court
Bucher & Sautter	Kansas City, Mo		March 5	1 horse	Suspected glanders	Quarantined
Frank Smith	Kansas City, Mo	Humane Society	March 9	1 horse	Chronic glanders	Quarantined and reported to county court
J. W. Mallin	Kansas City, Mo	Owner	March 10	1 horse	Chronic glanders	Quarantined and reported to county court
Ben Lusk	Kansas City, Mo	Dr. Gatchell	March 11	1 horse	Chronic glanders	Quarantined and reported to county court
C. W. Brady	Independence, Mo	Owner	March 16	1 gelding	Chronic glanders	Quarantined and reported to county court
McKibben's Livery	Kansas City, Mo	Owner	March 18	Gelding	Chronic glanders	Destroyed
Logan's laundry	Kansas City, Mo	Humane officer	March 22	1 gelding	Chronic glanders	Quarantined and reported to county court
J. B. Cruse	Kansas City, Mo	Owner	March 22	1 gelding	Pharangeal paralysis	
Jas. Morton's Sons	Kansas City, Mo		March 30	1 horse	Suspected glanders	Mallein test
J. W. Mallin	Kansas City, Mo	Return visit	March 30	Stable		Found cleaned and disinfected
D. Ricketts	Kansas City, Mo		March 31	1 horse	Suspected glanders	Quarantined and reported to county court
S. Warnall	Grandview, Mo	Secretary Elis	April 2	Cattle	Emaciation	
Toney Croowppo	Kansas City, Mo		April 5	1 horse	Chronic glanders	Quarantined and reported to county court
J. A. Truman and others	Grandview, Mo	Secretary Ellis	April 10	Cattle	Starvation	
Sam Mnookin	Kansas City, Mo	Dr. Byrd	April 17	1 horse	Chronic glanders	Quarantined and reported to county court
Greene Walter	Kansas City, Mo		April 18	1 horse	Chronic glanders	Quarantined and reported to county court
Ricketts	Randolph, Mo	Owner	April 25	1 horse	Suspected glanders	Quarantine continued

John Bismell	Kansas City, Mo	Humane officer	April 27	1 gelding	Nasal catarrh	
F. J. Courtwright	Kansas City, Mo	Dr. Gatchell	April 28	1 gelding	Chronic glanders	Quarantined and reported to county court
H. E. Schencker	Kansas City, Mo	Owner	April 28	1 gelding	Purpura	
Mr. Flanders	Kansas City, Mo	S. L. Stewart	May 1	1 horse	Dead on arrival	
Christianson & Glenn	Kansas City, Mo	Dr. Merker	May 1	1 horse	Infected carpal sheath	
Lorango Bresto	Kansas City, Mo	Owner	May 3	1 horse	Suspected glanders	Tested and reported to county court
L. Saffron	Kansas City, Mo	Owner	May 5	1 horse	Suspected glanders	Tested and reported to county court
Lorango Bresto	Kanas City, Mo	Owner	May 6	1 stable		Found disinfected
Samuel Weill	Kansas City, Mo	Dr. Gatchell	May 14	1 horse	Chronic glanders	Quarantined and reported to county court
W. G. Tull	Kansas City, Mo	Humane officer	May 19	1 horse	Chronic glanders	Quarantined and reported to county court
Tulso Feed Co.	Kansas City, Mo	Owner	May 19	1 horse	Skin eruption	
Amos West	Kansas City, Mo		May 23	1 horse		
T. C. Brontross	Kansas City, Mo	Neighbors	May 24	1 horse	Suspected glanders	Quarantined
E. L. Dicke	Kansas City, Mo		May 28	1 horse	Chronic glanders	Quarantined and reported to county court
T. C. Brontross	Kansas City, Mo	Owner	June 1	1 gelding	Glanders	Quarantined and reported to county court
W. S. Dickey	Kansas City, Mo	Mr. Luther	June 2	1 mare	Strangles	
Western Roofing Co.	Kansas City, Mo	Dr. Gatchell	June 7	2 horses	Chronic glanders	Quarantined and reported to county court
Geo. Partomar	Kansas City, Mo		June 9	1 horse	Suspected glanders	Quarantined
John Winters	Kansas City, Mo	Humane officer	June 17	2 horses	Suspected glanders (Payemia)	
Dr. W. J. McAninch	Butler, Mo		June 16	Cattle		
E. C. Yates	Kansas City, Mo	Dr. Gatchell	June 20	1 gelding	Chronic glanders	Quarantined
Fred Larson	Kansas City, Mo	Brought to hospital	June 25	1 gelding	Chronic glanders	Quarantined
A. G. Andelaft	Kansas City, Mo		June 25	1 gelding	Suspected glanders	Died
D. E. Justess	Kansas City, Mo	Dr. Gatchell	July 1	1 horse	Chronic glanders	Quarantined and reported to county court
B. F. Anderson	Kansas City, Mo	Owner	July 4	1 horse	Chronic glanders	Quarantined and reported to county court
Geo. Partronnar	Kansas City, Mo	Owner	July 5	1 horse	Chronic glanders	Quarantined and reported to county court
Mr. Buckley	Kansas City, Mo	Dr. Moberly	July 6	1 mare	Suspected glanders	Held for development
Fred Larson	Kansas City, Mo		July 6	Stable		Found disinfected

ANNUAL REPORT OF DR. R. C. MOORE, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 17, 1908, TO DEC. 31, 1909—Continued.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
Wm. W. Bates	Kansas City, Mo	Dr. Gatchell	July 8	1 gelding	Chronic glanders	Quarantined and reported to county
W. F. Howard	Kansas City, Mo	Humane officer	July 9	1 gelding	Chronic glanders	Quarantined and reported to county court
Mr. Hazelwood	Kansas City, Mo	Found on street	July 11	1 gelding	Suspected glanders	Held for development
Delio Kirkpatrick	Kansas City, Mo	Owner	July 12	1 gelding	Chronic glanders	Quarantined and reported to county court
J. M. Katzmaier	Kansas City, Mo	Owner	July 14	1 gelding	Nasal catarrh	
K. C. Southern Ry	Drexel, Mo	Dr. Luckey	July 15	Cattle	Texas fever	Stock yards quarantined
Hodley Grocery Co	Mt. Washington, Mo	Owner	July 16	1 mare	Catarrh of guttural pouch	
J. E. Hazelwood	Kansas City, Mo		July 17	1 gelding	Chronic glanders	Quarantined and reported to county court
St. Agnes Academy	Kansas City, Mo	Dr. Ritter	July 18	1 gelding	Chronic glanders	Quarantined and reported to county court
R. J. Reinach	Kansas City, Mo		July 19	1 gelding	Suspected glanders	Mallein test
Various farmers	Drexel & Lisle, Mo		July 21, 22, 23	Cattle	Texas fever	
Mo. Dairy	Kansas City, Mo		July 24	1 horse	Suspected glanders	Mallein test
W. A. Boles	Kansas City, Mo	Brought to hospital.	July 24	1 horse	Chronic glanders	Quarantined and reported to county court
Nelson Saul	Sugar Creek, Mo	Owner	July 25	1 gelding	Chronic glanders	Quarantined and reported to county court
Marney Flardi	Kansas City, Mo	Dr. Byrd	July 26	1 horse	Chronic glanders	Quarantined and reported to county court
W. E. Baker	Kansas City, Mo	Police	July 26	1 horse	Suspected septic pneumonia	Died
W. A. Wilson	Kansas City, Mo	Owner	July 28	1 gelding	Suspected glanders	Mallein test
Mr. Goodrich	Kansas City, Mo	Owner	July 28	1 horse	Pharangeal paralysis	
Halliwell Cement Co	Kansas City, Mo		July 29	1 mule	Suspected glanders	Mallein test
Joe Sutta	Kansas City, Mo		July 30	1 gelding	Chronic glanders	Quarantined and reported to county court
Sisters of Mercy	Kansas City, Mo		July 29	Stable		Found disinfected
W. A. Bates	Kansas City, Mo		July 30	Stable		Found disinfected
Robert Aldrich	Kansas City, Mo		July 30	1 gelding	Chronic glanders	Quarantined and reported to county court
Mr. Buckley	Kansas City, Mo	Dr. Moberly	July 31	1 Mare	Suspected glanders	Quarantine continued

Campbell Bros.	Hickman Mills, Mo		Aug. 1	Several horses		Released from quarantine
Unknown	Kansas City, Mo	Dr. Gatchell	Aug. 5	1 mule	Supposed glanders	Not found
G. T. Kinney	Kansas City, Mo	Dr. Werner	Aug. 2	2 geldings	Chronic glanders	Quarantined and reported to county court
D. Nast	Kansas City, Mo	Owner	Aug. 2	1 mule	Chronic glanders	Quarantined and reported to county court
H. Widlansky	Kansas City, Mo	Owner	Aug. 4	1 gelding	Suspected glanders	Tested–reaction. Quarantined and reported to county court
Max Studna	Kanssas City, Mo	Owner	Aug. 6	1 gelding	Suspected glanders	
Geo. Hors	Kansas City, Mo		Aug. 6	1 mule	Chronic glanders	Quarantined and reported to county court
N. Kantel	Kansas City, Mo	Dr. Werner	Aug. 9	1 mare	Chronic glanders	Quarantined and reported to county court
Mr. Ricks	Kansas City, Mo	J. A. Carver	Aug. 10	1 mare	Lymphangitis	
Hugh Hors	Kansas City, Mo	Police	Aug. 11	1 horse	Chronic glanders	Quarantined and reported to county court
American Express Co	Kansas City, Mo	Owner	Aug. 12	1 gelding	Suspected glanders	Mallein test
Mrs. J. R. Patterson	Kansas City, Mo	Owner	Aug. 12	1 gelding	Chronic glanders	Quarantined and reported to county court
John Garlish	Kansas City, Mo	Dr. Trickett	Aug. 18	1 mare	Chronic glanders	Quarantined and reported to county court
Willis Maynard	Kansas City, Mo		Aug. 18	1 gelding	Chronic glanders	Quarantined and reported to county court
J. S. Wolf	Kansas City, Mo	Dr. Hickman	Aug. 19.	1 gelding	Chronic glanders	Quarantined and reported to county court
M. Conklin	Kansas City, Mo	Dr. Gatchell	Aug. 22	1 gelding	Chronic glanders	Quarantined and reported to county court
Joe Stringer	Kansas City, Mo	Mr. Davis	Aug. 23	2 geldings	Stock yard fever	
N. Kantel	Kansas City, Mo	Owner	Aug. 23	1 mare	Suspected glanders	Tested reaction. Quarantined and reported to county court
Smith Yost Pie Co	Kansas City, Mo		Aug. 23	1 horse	Chronic glanders	Tested–reaction. Quarantined and reported to court
Oscar Pearson	Kansas City, Mo	Dr. Moberly	Aug. 24	1 gelding	Chronic glanders	Tested–reaction. Quarantined and reported to court
Hugh Hors	Kansas City, Mo		Aug. 25	Stable		Found disinfected
Franklin Ice Cream Co.	Kansas City, Mo	Owner	Aug. 25	1 gelding	Suspected glanders	Tested
J. N. Nickson	Kansas City, Mo	Board of Health	Aug. 26	1 horse		Dead on arrival
J. A. Johnson	Kansas City, Mo	Owner	Aug. 26	1 mule	Chronic glanders	Quarantined and reported to court.
M. Hoffman	Kansas City, Mo	Owner	Aug. 27	1 gelding	Chronic glanders	Quarantined and reported to court.
S. Cross	Kansas City, Mo	Humane officer	Aug. 28	1 horse	Chronic glanders	Quarantined and reported to court.

ANNUAL REPORT OF DR. R. C. MOORE, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 17, 1908, TO DEC. 31, 1909—Continued.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
Matthias Baking Co	Kansas City, Mo	Owner	Aug. 28	1 gelding	Suspected glanders	Held for development
Henry Matthias	Kansas City		Aug. 29	1 gelding	Chronic glanders	Quarantined and reported to court.
Allen Macks	Kansas City, Mo	Owner	Aug. 30	1 gelding	Chronic glanders	Quarantined and reported to court.
Albert Ridenour	Kansas City, Mo	Dr. Trickett	Aug. 30	1 gelding	Chronic glanders	Quarantined and reported to court.
Hydraulic Press Brick Co	Kansas City, Mo	Owner	Aug. 31	1 gelding	Suspected glanders	Held for development
Wolf Bros.' Laundry	Kansas City, Mo	Owner	Sept. 1	1 mule	Chronic glanders	Quarantined and reported to court.
Tom Fox	Kansas City, Kan	Humane officer	Sept. 3	1 horse	Chronic glanders	Reported to Kansas State Board.
Allen Macks	Kansas City, Mo	Return visit	Sept. 4	1 stable		Found O. K
Union Pacific Tea Co	Kansas City, Mo		Sept. 4	1 mare	Chronic glanders	Quarantined and reported to court.
Henry Wise	Sheffield, Mo	Owner	Sept. 5	1 horse	Glanders	Destroyed
Hydraulic Brick Co	Kansas City, Mo	Owner	Sept. 5	1 horse	Suspected glanders	Held for development
R. E. Williams	Kansas City, Mo	Dr. Dicke	Sept. 6	1 mule	Chronic glanders	Quarantined and reported to court.
Halliwell Cement Co	Kansas City, Mo	Owner	Sept. 7	1 mule	Glanders	Destroyed
Phillip Burns	Kansas City, Mo	Owner	Sept. 9	1 horse	Chronic glanders	Quarantined and reported to county court
A. A. Nichol	Kansas City, Mo	Dr. Lane	Sept. 9	1 gelding	Glanders	Destroyed
Mayor of Independence	Independence, Mo		Sept. 10	1 mare	Melanosis of proteid	
Warneke Bakery	Kansas City, Mo		Sept. 11	1 gelding	Suspected glanders	Held for test
Mr. Buckeye	Kansas City, Mo		Sept. 11	1 mule	Suspected glanders	Found free from disease
Halliwell Cement Co	Kansas City, Mo	Owner	Sept. 13	1 horse	Suspected glanders	Held for development
Dr. Moberly	Kansas City, Mo	Owner	Sept. 13	1 mare	Purulent cellulitis of hock	
Hydraulic Brick Co	Kansas City, Mo		Sept. 14	1 mule	Chronic glanders	Quarantined and reported to court
H. R. Huhn	Kansas City, Mo	Police	Sept. 15	1 mare	Suspected glanders	Quarantined
Jacob Tint	Kansas City, Mo	Owner	Sept. 15	1 horse	Chronic glanders	Quarantined and reported to court.
Wolf Transfer Co	Kansas City, Mo	Owner	Sept. 15	1 mule	Glanders	Dead on arrival
James Catalons	Kansas City, Mo	Owner	Sept. 18	1 horse	Chronic glanders	Reported to county court
A. W. Bear Com. Co	Kansas City, Mo	Owner	Sept. 16	2 mares	Glanders	Reported to county court
Matthias Bakery	Kansas City		Sept. 20	2 horses	Suspected glanders	Held for development
Warnake Bakery	Kansas City		Sept 20	4 horses	Suspected glanders	Held for development
Bartholomes	Lisle, Mo	Owner	Sept. 21	Cattle	Texas fever	
Harris Ricks	Kansas City, Mo	Owner	Sept. 21	1 mare	Suspected glanders	Held for test
Floyd Silsbee	Kansas City, Mo	Owner	Sept. 22	1 gelding	Chronic glanders	Quarantined and reported to court.
H. R. Huhn	Kansas City, Mo	Owner	Sept. 24	1 mare	Suspected glanders	Held for development
D. A. Blanchard	Richmond, Mo	Owner	Sept. 24	1 gelding	Suspected glanders	Held for development
W. J. Lemp Brewing Co	Kansas City, Mo	Dr. Gatchell	Sept. 25	1 gelding	Chronic glanders	Quarantined and reported to court.

Harris Ricks	Kansas City, Mo		Sept. 25	1 mare	Chronic glanders	Quarantined and reported to court.
Unknown	Kansas City, Mo	Humane Society	Sept 27	1 gelding	Inspection of puncture wound	
Warnake Bakery	Kansas City, Mo		Sept. 26	2 horses	Suspected glanders	Held for investigation
Warnake Bakery	Kansas City, Mo		Sept. 26	1 gelding	Suspected glanders	Tested and reported to court
C. C. Yates	Kansas City, Mo	Owner	Sept. 26	1 horse	Suspected glanders	Held for investigation
D. A. Blanchard	Kansas City, Mo		Sept. 27	1 gelding	Chronic glanders	Quarantined and reported to county court
Matthias Bakery	Kansas City, Mo	Owner	Sept. 27	2 horses	Reaction to Mallein	Quarantine continued
Snydam Bakery	Kansas City, Mo	Owner	Sept. 28	1 gelding	Strangles	
Ike Kelly	Kansas City, Mo	Brought to hospital	Sept. 29	1 gelding	Suspected glanders	Tested and quarantined and reported to court
C. A. Brown	Kansas City, Mo	Mr. Raticon	Sept. 30	1 gelding	Chronic glanders	Dead on arrival
E. J. Hoog	Kansas City, Mo	Dr. Werner	Oct. 1	1 gelding	Chronic glanders	Quarantined and reported to county court
Emrick Vinegar Works	Kansas City, Mo	Owner	Oct. 1	1 gelding	Pyemia	
Nelson Saul	Sugar Creek	Owner	Oct. 2	1 gelding	Skin irritation	
W. S. Lyons	Sheffield, Mo	Owner	Oct. 4	1 gelding	Pneumonia	
H. P. Kuhn	Kansas City, Mo	Owner	Oct. 6	1 mare		
Unknown	Kansas City, Mo	Humane Society	Oct. 8			
L. Leritz	Kansas City, Mo	Owner	Oct. 9	2 horses	Chronic glanders	Quarantined and reported to court.
Andy Krautlager	Kansas City, Mo	Owner	Oct. 11	1 gelding	Chronic glanders	Quarantined and reported to court.
G. W. Yates	Kansas City, Mo	Owner	Oct. 11	1 gelding	Suspected glanders	Released
W. L. Renne	Kansas City, Mo	Owner	Oct. 13	1 gelding	Chronic glanders	Quarantined and reported to court.
F. Burton	Kansas City, Mo	Dr. Nichols	Oct. 14	1 horse	Glanders	Destroyed
C. A. Brown	Kansas City, Mo		Oct. 16	1 stable		Found O. K
L. Harris	Kansas City, Mo		Oct. 18	1 gelding	Glanders	Quarantined and reported to county court
Unknown	Kansas City, Mo	Found on street	Oct. 21	1 gelding	Chronic glanders	Destroyed
Mr. Hostetter	Kansas City, Mo	County clerk	Oct. 22	1 mare	Purpura	
Wolf Bros.' Laundry	Kansas City, Mo	Brought to hospital	Oct. 22	1 gelding	Chronic glanders	Quarantined and reported to court.
Klump Transfer Co	Kansas City, Mo		Nov. 3.	1 mare	Glanders	Quarantined and reported to court.
F. M. Kelly	Kansas City, Mo	Dr. Laws	Nov. 4	1 gelding	Chronic glanders	Quarantined and reported to court.
S. J. Pryor	Kansas City, Mo		Nov. 5	1 gelding	Chronic glanders	Quarantined and reported to court.
Frank B. Rohe	Kansas City, Mo	Owner	Nov. 9	2 geldings	Chronic glanders	Quarantined and reported to court.
D. C. Koen	Kansas City, Mo	Owner	Nov. 9	1 mare	Chronic glanders	Quarantined and reported to court.
R. Nicholson	Kansas City, Mo	Dr. Van Dusen	Nov. 10	1 gelding	Chronic glanders	Quarantined and reported to court.
H. Aaron	Kansas City, Mo	Owner	Nov. 10	1 gelding	Glanders	Destroyed
Board af Education	Kansas City, Mo	Owner	Nov. 11	1 gelding	Glanders	Qnarantined and reported to court.
C. S. Jones	Kansas City, Mo	Brought to hospital	Nov. 17	1 gelding	Suspected glanders	Test—no re-reaction

ANNUAL REPORT OF DR. R. C. MOORE, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 17, 1908, TO DEC. 31, 1909—Continued.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
Dr. Reichenecker	Blue Springs, Mo	Geo. B. Ellis	Nov. 19	1 gelding	Diiation of oesophagus	
Frank B. Rohe	Kansas City, Mo		Nov. 20	1 stable		Found K. O
R. Nicholson	Kansas City, Mo		Nov. 20	1 stable		Found O. K
E. M. Clay	Kansas City, Mo	Owner	Nov. 22	1 gelding	Chronic glanders	Quarantined and reported to court.
J. S. Pryor	Kansas City, Mo	County clerk	Nov. 24	Horses		Could not find them
E. M. Clay	Kansas City, Mo	Brought to hospital.	Nov. 28	1 gelding	Suspected glanders	Tested
Wm. Shipley	Kansas City, Mo	Owner	Nov. 28	1 gelding	Chronic glanders	Quarantined and reported to court
Wm. Walbrom	Kansas City, Mo	Dr. Gatchell	Nov. 29	1 gelding	Chronic glanders	Quarantined and reported to court.
Luther Trent	Kansas City, Mo	Owner	Nov. 30	1 gelding	Chronic glanders	Destroyed
Unknown	Kansas City, Mo	Humane officer	Dec. 6	1 gelding	Chronic glanders	Destroyed
J. A. Alexander	Kansas City, Mo	Walter Lopp	Dec. 9	1 gelding	Chronic glanders	Quarantined and reported to court
G. W. Mensing	Kansas City, Mo	Owner	Dec. 2	1 gelding	Chronic glanders	Quarantined and reported to court.
G. W. Mensing	Kansas City, Mo		Dec. 13	2 geldings	Suspected glanders	Tested, no reaction
J. J. Hess	Kansas City, Mo	Dr. Gatchell	Dec. 15	1 gelding	Chronic glanders	Quarantined and reported to court.
Lewis Gesman	Kansas City, Mo	Owner	Dec. 15	1 gelding	Chronic glanders	Destroyed
J. W. Watson	Kansas City, Mo	Owner	Dec. 17	1 gelding	Chronic glanders	Destroyed
Thos. Sheehy	Kansas City, Mo	Owner	Dec. 18	1 gelding	Chronic glanders	Quarantined and reported to county court
G. W. Mensing	Kansas City, Mo		Dec. 19	1 stable		Released from quarantine
Dr. Gatchell	Kansas City, Mo		Dec. 20	1 gelding	Nasal catarrh	
	Kansas City, Mo	Owner	Dec. 25	1 horse	Ulcerated tooth	

ANNUAL REPORT OF DR. ARTHUR J. HAMMERSTEIN, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 10, 1908, TO DEC. 31, 1909.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1908			
Henry Waldemeyer	St. Louis, Mo	By owner	Dec. 10	1 black gelding	Chronic farcy	Destruction and thorough disinfection
Wm. Redemeyer	St. Louis, Mo	By Secretary Ellis.	Dec. 10			
Geo. Domenick	St. Louis, Mo	Neighbor	Dec. 12	1 bay gelding	Glanders and farcy	Destruction and thorough disinfection
William Anders	St. Louis, Mo	Humane Society	Dec. 18	1 chestnut gelding	Nasal gleet, disability	Destruction, unfit for further service.

			1909.			
Louisa Mueller	St. Louis, Mo	Neighboring team owner	Jan. 2	1 bay gelding	Latent glanders	Tested with Mallein
Louisa Mueller	St. Louis, Mo		Jan. 3	1 bay gelding	Glanders and farcy	Destruction and thorough disinfection
Fred Zeigler	St. Louis, Mo	By owner	Jan. 4	2 black geldings	Chronic glanders	Destruction and disinfection
Fred Zeigler	St. Louis, Mo	By owner	Jan. 5	1 black gelding	Chronic glanders	Destruction and disinfection
Henry Peppers	Eureka, Mo	Attending Veterinarian	Jan. 10	4 horses	Catarrhal fever	Appropriate treatment
August Krumsey	Ballwin, Mo	Attending Veterinarian	Jan. 24	1 bay horse	Paraphymosis	Amputation and castiation
Police Department	City of St. Louis	Police Department	Jan. 25	1 gray gelding	Nasal gleet	Case turned over to Missouri Humane Society
Lawrence Harris	St. Louis, Mo	Police Department	Feb. 4	1 gray gelding	Nasal gleet	Destruction
L. Becker	St. Louis, Mo	Attending Veterinarian	Feb. 20	1 bay gelding	Chronic farcy and glanders	Destruction and disinfection
Fleishman Compressed Yeast Co	St. Louis, Mo	State Board of Agriculture	March 30	1 chestnut gelding	Latent glanders	Tested with Mallein
Henry Westerfield	St. Louis, Mo	Neighboring owners	March 31	1 bay gelding	Chronic nasal gleet	
Frank Valentine	St. Louis, Mo	Police Department	April 2	1 black gelding	Acute glanders	Thorough disinfection
Fred Stilt	St. Louis, Mo	Attending Veterinarian	April 3	1 gray gelding	Chronic pharyngitis	
Fred Huffmeier	Defiance, Mo	Secretary Ellis	April 5	5 grade cattle	Acute gastritis	Change method of feeding
P. H. Berkley	St. Louis, Mo	Attending Veterinarian	April 7	1 black gelding	Chronic glanders	Destruction and disinfection
Fleishman Compressed Yeast Co	St. Louis, Mo	Attending Veterinarian	April 8	1 chestnut gelding	Chronic glanders	Destruction and disinfection
Fred Hoffmeier	Defiance, Mo	By owner	April 25	2 cattle (stockers)	Acute gastritis	Change in method of feeding
Edw. Nodika	St. Louis, Mo	Attending Veterinary	May 7	1 bay gelding	Chronic farcy	Destruction and disinfection
Thomas Pigg	St. Louis, Mo	Attending Veterinary	May 11	1 bay mare	Latent glanders	Advised owner to use animal with necessary percautions

ANNUAL REPORT OF DR. ARTHUR J. HAMMERSTEIN, DEPUTY STATE VETERINARIAN, FOR YEAR DEC. 10, 1908, TO DEC. 31, 1909—Con'td

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
Thomas B. North	Grey's Summit, Mo	Secretary Ellis	May 28	Grade cattle	Rabies	Advised county authorities to notify all owners of dogs to keep them tied for 3 months and to shoot all stray dogs
J. H. Hardaman	Grey's Summit	Secretary Ellis	May 28	Grade cattle	Rabies	
J. H. Rutherford	Grey's Summit, Mo	Secretary Ellis	May 28	Grade cattle	Rabies	
Sam Christo	St. Louis, Mo	Attending Veterinarian	May 30	1 chestnut gelding	Chronic farcy	Destruction and disinfection
Edw. Nodika	St. Louis, Mo	By owner	May 31	1 brown gelding.	Chronic farcy	Destruction and disinfection
Wm. C. Grimm and son	St. Louis, Mo	Attending Veterinarian	June 8	1 black gelding	Chronic farcy	Owner allowed to use animal with the usual instructions
Sam Christi	St. Louis, Mo	Court of criminal correction	June 24	1 chestnut gelding	Chronic farcy	Destruction and disinfection
Henry Waldemeyer	St. Louis, Mo	Attending Veterinarian	June 47	1 black gelding	Acute glanders and farcy	Immediate destruction and disinfection
Henry Feuss	St. Louis, Mo	Attending Veterinarian	July 6	1 bay gelding	Pemphigus	Appropriate treatment
Zeigler Bros	St. Louis, Mo	By owner	July 7	1 gray gelding	Chronic glanders and farcy	Destruction and disinfection
Henry Waldemeyer	St. Louis, Mo	By owner	July 14	1 black gelding	Acute glanders and farcy	Destruction and the usual instructions
Henry Waldemeyer	St. Louis, Mo	By owner	July 25	1 black gelding	Chronic glanders	Destruction
Henry Waldemeyer	St. Louis, Mo	By owner	July 26	1 bay gelding	Latent glanders	Destruction
J. L. Clarkson	St. Louis, Mo	Dr. Shaffer	Aug. 5	1 bay gelding	Acute glanders and farcy	Destruction and thorough disinfection
Henry Waldmeyer	St. Louis, Mo	By owner	Aug. 16	1 black gelding	Chronic glanders	Destruction and disinfection
J. L. Castilio	Howell, Mo	Secretary Ellis	Aug. 21	500 sheep	Infectious pneumonia.	Separating the healthy from the sick. Stimulants and tonics
Barney Held	St. Louis, Mo	By owner	Aug. 22	1 black gelding	Chronic glanders	Destruction and disinfection
Israel Nehamen	St. Louis, Mo	By owner	Aug. 24	1 chestnut gelding	Chronic farcy	Destruction and disinfection

Dan Grieser	St. Louis, Mo	Attending Veterinarian	Sept. 25	1 gray gelding	Chronic nasal gleet	Appropriate treatment
John Lojett	St. Louis, Mo	Attending Veterinarian	Oct 5	1 bay mule	Pemphigus	Proper treatment
Ernest Hassendeubel	St. Louis, Mo	Dr. Klennen	Oct. 7	1 bay mare	Suspicious farcy	Advised owner to use with certain restrictions
R. S. Hazen	St. Louis, Mo	Dr. Sollberger	Oct. 25	1 bay gelding	Acute glanders	Destruction
Theo. E. Flais	St. Louis, Mo	By owner	Dec. 10	1 bay gelding	Acute glanders and farcy	Destruction and thorough disinfection
W. W. Armstrong	St. Louis, Mo	By owner	Dec. 18	1 bay gelding	Acute glanders and farcy	Destruction and disinfection

ANNUAL REPORT OF DR. T. E. WHITE, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 17, 1908, TO DECEMBER 17, 1909.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1909			
J. B. Wampler	Knobnoster, Mo	Secretary Ellis	Feb. 15	Sheep	Scabies	A number had had scabies but were found cured. Gave certificate of health
G. E. Thompson	Tipton, Mo	Dr. Luckey	May 23	1 horse	Nasal catarrh	Instructed how to treat
Geo. Thomas	Bunceton, Mo	Secretary Ellis	Oct. 16	Mules	Spinal meningitis	

ANNUAL REPORT OF DR. R. J. MITCHELL, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 17, 1908, TO DECEMBER 17, 1909.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1909			
Wm. H. Miller	La Belle, Mo	Secretary Ellis	April 28	1 gray mare	Purpura hemorrhagica	Usual treatment

ANNUAL REPORT OF DR. JAS. CULLISON, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 17, 1908, TO DECEMBER 17, 1909.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1908			
Alia Lee	Medle's Landing, Mo	Return visit	Dec. 25	1 mule	Distemper	
			1909			
Farmer's Supply Co	Sikeston, Mo	Letter	Feb. 8	1 horse	Glanders	Animal died before call
C. L. Proffit	Point Pleasant, Mo	Letter	Feb. 15	1 mare, 2 mules	Chronic glanders	Disinfection
C. L. Proffit	Point Pleasant, Mo	Return visit	March 17	1 mule	Distemper	
Harvey E. Moore	Charleston, Mo	Return visit	June 3	1 horse, 1 mule	Glanders	Thorough disinfection
Harvey E. Moore	Charleston, Mo	Return visit	June 17	1 horse	Suspected glanders	Great care urged to keep horse away from those quarantined
M. F. Powers	East Prairie, Mo	Observed while in East Prairie	Sept. 15	1 mule	Chronic glanders	Destruction and disinfection
W. L. Powers	East Prairie, Mo		Sept. 18	1 mule	Farcy suspected	
Cy. Lomax and Jack Harris	Commerce, Mo	By phone	Oct 14	2 horses	Glanders	Quarantined
C. C. Conyers	East Prairie, Mo	Private practice	Oct. 30	1 horse	Chronic glanders	Quarantined
Chas. R. Marshall	Commerce, Mo	Private practice	Nov. 4	2 mules	Glanders	Quarantined
Harvey E Moore	Charleston, Mo	Return visit	Nov. 19	1 horse	Chronic glanders	Quarantined
Chas. R. Marshall	Commerce, Mo	Return visit	Nov. 21	1 mule	Glanders	Quarantined

ANNUAL REPORT OF DR. L. G. CLARK, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 17, 1908, TO DECEMBER 17, 1909.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1909			
J. S. Blizzard	Butler, Mo	Secretary Ellis	Oct. 20	1 mule	Acute glanders	Animal died before call, remainder of horses and mules quarantined.

ANNUAL REPORT OF DR. W. B. WELCH, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 17, 1908, TO DECEMBER 28, 1909.

Owner.	Postoffice	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1909			
C. W. Seidet	Salisbury, Mo	Secretary Ellis	May 16	1 gelding	Pneumonia	
Lee Hays	Forrest Green, Mo	Secretary Ellis	July 7	Cows	Ergotism	

ANNUAL REPORT OF DR. H. H. WOLF, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 17, 1908, TO DECEMBER 28, 1909.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1909			
Henry Clouse	Watson, Mo	Secretary Ellis	Feb. 16	4 horses, 1 mule	Mange	Prescribed treatment
Albert Tritten	Helena, Mo	Secretary Ellis	June 23	1 cow	Actinomycosis	Prescribed treatment
Clemen Butler	King City, Mo	Secretary Ellis	Aug. 6	Cows		Dead on arrival
W. A. Richards	Rockport, Mo	Secretary Ellis	Sept. 13	Horse		Dead on arrival
Newt Wallace	Langdon, Mo	Secretary Ellis	Sept. 27	Horses	Glanders	Ordered killed
Chas. N. Hassler	Guilford, Mo	Secretary Ellis	Dec. 9	Mule	Glanders	Ordered killed

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